The Infantry School

MAILING LIST

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Containing the Latest Thought on Infantry

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PREFACE

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CHAPTER 1

Defense of an Airport Against an Airborne Attack

The use of parachute and air landing troops has created a new element in warfare with which we must cope. It has been demonstrated, however, that these troops are particularly vulnerable to a defense especially adapted to meet them. The following account of the defense of an airport against this type of attack is based upon information available as to the most successful methods so far adopted. The situation presented is purely hypothetical, but the methods presented are an accumulation of successful parts of actual situations.

"How to defend an airport?" Lieutenant Colonel Doughfoot, commanding an infantry battalion which is in Xth corps reserve, considers this question as he runs over in his mind such knowledge as he has acquired regarding the attack methods of airborne troops and the methods of countering them. It is 1:00 PM, August 8, and he is standing before Colonel Plan (G-3 of the Corps) in a small house on the outskirts of Stilesville, about 40 miles from the advancing Japanese. He has just been assigned the mission of defending with his battalion the airport near the town of Jonesville. Colonel Plan, acquainting him with the situation, continues:

"Strong Japanese forces pushing to the southwest have reached a line whose nearest point is about 35 miles from

Note: In this account, units are organized according to Tables of Organization dated October 1, 1940, except that 37-mm antitank guns have replaced the caliber .50 machine guns in the heavy weapons company.

Jonesville. This line is being held despite heavy pressure. Intelligence reports, however, indicate that enemy forces are being concentrated and that they may attempt a decisive blow at any time. They are known to have airborne troops available. Their observation, bombardment, and pursuit planes have been active over the entire area, and their air superiority is growing rapidly.

"You will have attached to your battalion one battery of 75-mm howitzers (truck drawn), one platoon of light tanks, one scout car platoon and enough transportation to permit the movement of your entire outfit on wheels. The artillery, tanks and scout car platoons are on their way to your bivouac now. Check with G-4 for details relative to the trucks.

"You will move your reinforced battalion to the airport at Jonesville, where you will make such dispositions as necessary for its defense against a probable airborne attack in the near future."

Colonel Doughfoot interrupts with a question: "I notice that there is a corps engineer dump located just east of Jonesville. Am I to consider defense of that installation, too?"

"No, you will be responsible only for the defense of the airport." Colonel Plan refers to the situation map before him on which locations of antiaircraft weapons are indicated. "In addition to the disposition of the antiaircraft regiment for antiaircraft defense of the airport and of corps establishments," he points out, "all installations have been provided with local security.

"Major Littleplan, my assistant, will give you a situation map and 10 copies of a contoured map of the airport area.

"The General wants to see you before you leave."

Colonel Doughfoot then obtains a copy of the situation map from the assistant G-3 who calls his attention to the fact that the map was drawn before the construction of the airport. Colonel Doughfoot then visits the office of the corps G-4, where he arranges to have 33 2½-ton trucks

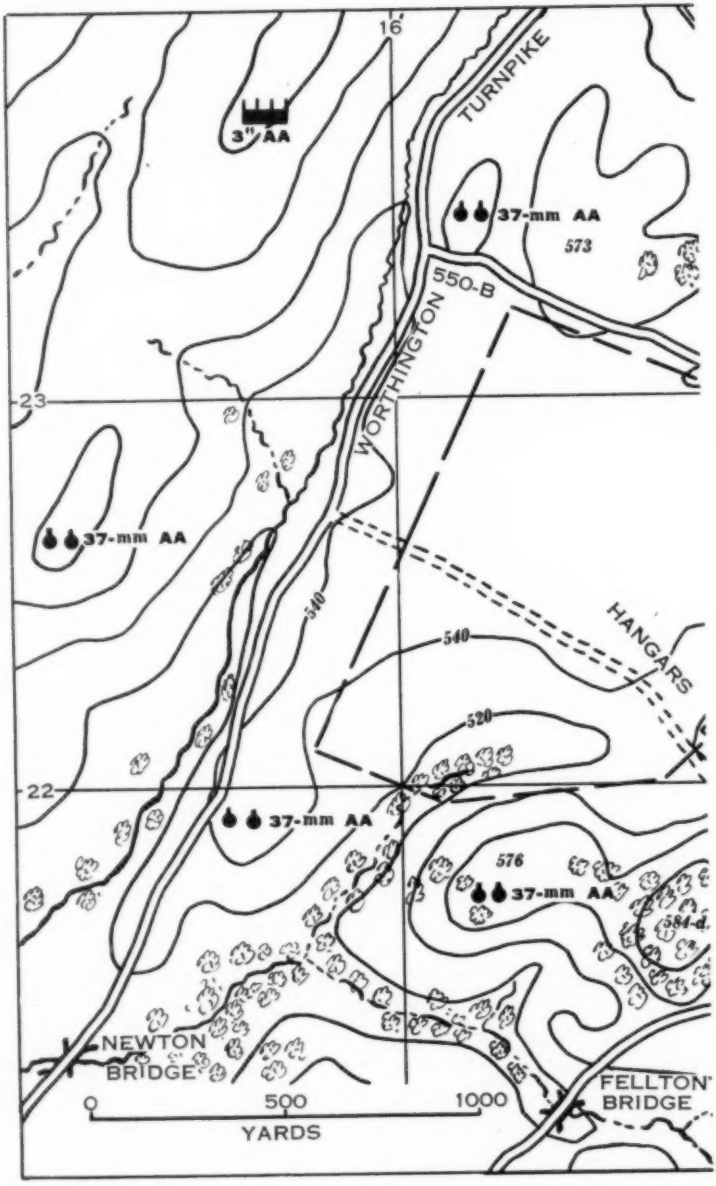
arrive at his battalion bivouac at 8:30 PM. In reply to a question, he is informed that he may obtain additional ammunition of all types at an army supply point three miles east of Jonesville.

He then reports to the corps commander. The General glances at a memorandum, and says: "Yes, Colonel, I wanted to see you to emphasize how you can utilize the local unit of the state guard. This is one of the principal missions it was created to perform. These men can be invaluable to you in securing rear areas and in handling widely dispersed parachute attacks. I have been informed that units in this vicinity are well trained and are available for immediate service. Contact their leaders in Jonesville for information as to local matters. Good luck to you in holding your airport. If you should fail, the base the Japs could establish there would endanger the entire Corps, so hang on to it at all costs."

Colonel Doughfoot then departs for his command post at the concealed battalion bivouac.

In addition to the supply, mess and administrative cares which normally burden a commander on a separate mission, he has now to think of operations dealing with this newer type of warfare; a type in which tactics, new technique and weapons are being developed more rapidly than in any other; one in which the decisive portion of the action is as fast and fleeting as any in which ground troops function. Faulty calculations, particularly as to the time element, may decide the entire issue.

During the trip to his command post, Colonel Doughfoot considers carefully the probable Japanese operations he will be called upon to meet. From his study of the reports of our observers in the various theaters of operation and similar reports of our Allies, he knows that certain tactical procedures followed by airborne troops have evolved from the war to date. Airborne attacks have usually consisted of three basic phases. What may be termed the first phase has been a prolonged, severe air attack. The enemy has attempted the complete reduction of defending aircraft by


16
TURNPIKE
3" AA
37-mm AA
573
550-B
WORTHINGTON
23
37-mm AA
540
HANGARS
540
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576
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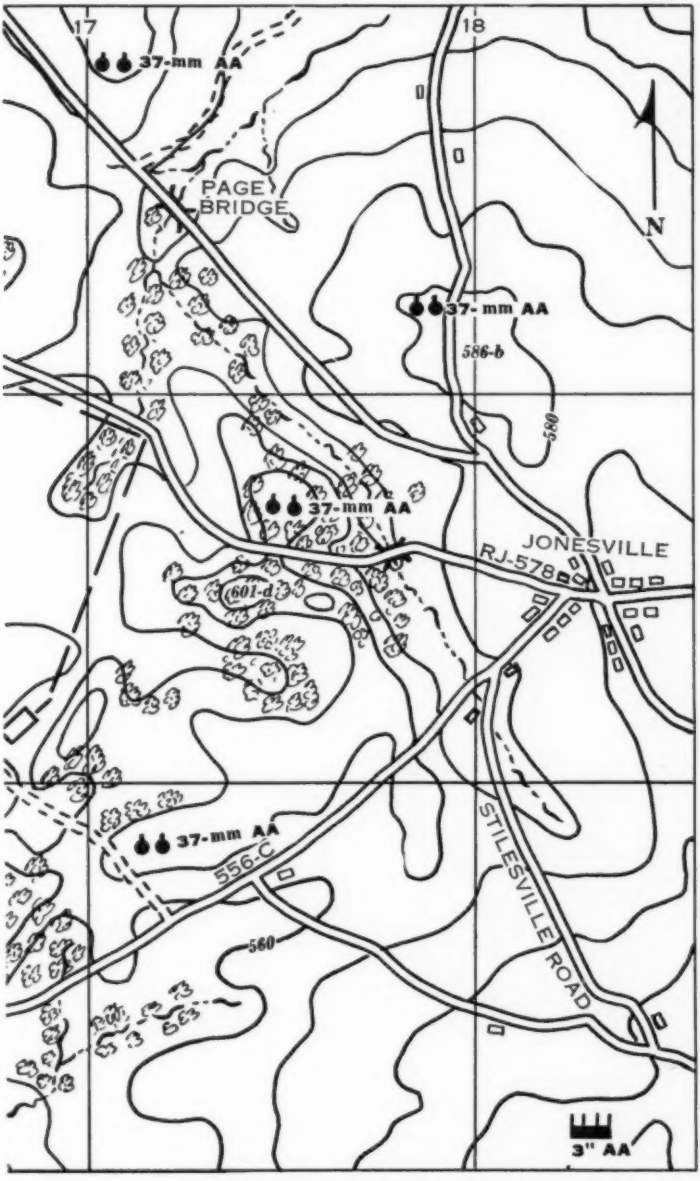


FIGURE 1.—Map given to Lieutenant Colonel Doughfoot by the Assistant G-3 of the Corps.

shooting them out of the air, destroying them on the ground, and by damaging all nearby airports. When local air superiority has been attained, heavy localized air bombardment has followed for the purpose of destroying defensive weapons and disorganizing defensive dispositions about the objective to be seized. This has been accomplished first by high-level bombing, followed—as antiaircraft action has become weakened—by lower-level bombing, strafing and dive-bombing attacks.

When defending weapons, which have been located, have been reduced and the defending troops thought to be disorganized, the second phase has been inaugurated. This has consisted of the dropping of parachutists simultaneously at many different localities close to, or even on, the objective. Bombing has been continued until the time of actual descent and to some extent even while the parachutists were descending. This final intense bombardment has forced the defenders to remain under cover of their foxholes and thus has covered the landing and initial operations of the parachutists. As soon as the parachutists have landed and obtained their equipment—likewise dropped by parachute—and have organized themselves into fighting units, they have completed the second phase by attacking to destroy or drive beyond range all defenders able to place fire on the landing field.

When parachutists on the ground have neutralized hostile fire and have sufficiently cleared the landing field of obstacles to permit the landing of planes, they have apparently signalled by radio or otherwise and the third phase has been inaugurated.

In this third or final phase, transport planes have landed on the field and unloaded air landing troops, including light artillery and even small tanks, in sufficient number to complete the seizure of the objective and such surrounding ground as has been necessary to secure it for use by the attacking force.

Transport planes, or gliders, carrying air landing troops have on at least one occasion landed with, or even prior to,

the parachutists. Such tactics have been costly in materiel and man power. The surprise thus gained, however, may have been the decisive factor in the success of the attack. If the objective is important enough, the risk of such materiel and man power may be worth while and this method of attack must be considered in making defensive plans to meet an airborne attack.

Upon his arrival at his command post, Colonel Doughfoot is advised by Major Exo (battalion executive and S-3) that a battery of artillery, a platoon of light tanks and a platoon of scout cars have arrived and been placed in concealed bivouacs.

"Good," replies Colonel Doughfoot, "have the commanding officers of these units, the company commanders and the staff officers assemble here at once."

While awaiting the arrival of these officers, Colonel Doughfoot runs over in his mind the points he wishes to cover in his instruction to them (warning order) and makes notes thereof. When informed by Major Exo that the group has assembled, he joins them and issues the following instructions:

"Our battalion with a battery of artillery, a platoon of tanks and a platoon of scout cars attached, is to move by motor, under cover of darkness tonight, on a special mission.

"I am leaving in ten minutes to make my reconnaissance. I want you, Captain Shoot (battery commander), Captain Deco (commanding Company D), Lieutenant Know (Battalion S-1—S-2), the Sergeant Major and four messengers to accompany me. Captain Shoot and Captain Deco each take one of your ¼-ton trucks and such personnel, up to its capacity, as you desire. Lieutenant Know, assemble the enlisted personnel from battalion headquarters, together with one of the command cars and one ¼-ton truck, so as to be ready to leave in ten minutes. You three officers may be excused now to make necessary arrangements."

After the three officers have left, the Colonel continues:

"Rifle company commanders will report individually at the road junction one fourth of a mile southwest of Jonesville (pointing to the junction meant on a road map) by 4:30 PM. A messenger will meet you there and guide you to the point where I will meet you.

"Each of you will unload one of the ¼-ton trucks of your weapons platoon and use it to transport yourself and your party. You will each need at least one man to use as a guide. The load of your ¼-ton truck will be moved on one of the trucks carrying personnel.

"The commanders of the tank platoon and the scout car platoon will report at the same time and place. Be sure to have with you a man to be used as a guide to meet your platoon tonight. Each of you will bring one vehicle only.

"Lieutenant Wheel (battalion transport officer), 33 2½-ton trucks from the corps pool will report here at 8:30. You will arrange to meet them and distribute them to the companies of the battalion.

"Major Exo, you will take charge of the movement of the battalion. The head of the column will move out at 9:00 PM. Permit no unusual activity prior to darkness and make the movement without lights. Battalion sections of the ammunition and kitchen and baggage trains will accompany the battalion. Attached non-organic trucks will remain with organizations after arrival in the new area. Guides from all units will meet the column at the same point where the unit commanders are reporting (the road junction ¼-mile southwest of Jonesville).

"Are there any questions?

"That is all, gentlemen."

Colonel Doughfoot then gets into his command car, accompanied by Lieutenant Know, the Sergeant Major and a messenger and, followed by the remainder of his party in three ¼-ton trucks, leaves for Jonesville.

As he rides along, many thoughts of the coming operation fill his mind. He is sure of one thing, however,—his decision to await darkness before moving the battalion is

sound. In this case, the importance of maintaining secrecy outweighs that of obtaining greater speed. His battalion is now in concealed bivouac—to move while there is still daylight would reveal the fact of the movement and subject the battalion to the possibility of bombardment while en-route. A daylight move would also reveal dispositions established about the airport, thus subjecting his organization to further bombing there. Finally, although over six hours of daylight remain, the necessary reconnaissance and issuance of orders will take up the greater part of that period.

Upon arrival at Jonesville Colonel Doughfoot stops and locates Captain Davis, the commander of the local unit of the State Guard. After acquainting him with his mission, Colonel Doughfoot asks, "How many men do you have ready to fight, Captain?"

"I can assemble 63 men within 3 hours at any point within 15 miles of the airport. Seventeen have caliber .30 rifles of various models, 4 have Tommy guns and the remainder are armed with shotguns or pistols," the Captain replies with evident pride. It is obvious that he has spent considerable time in training his organization and is confident of the results. "With a little more notice," he continues, "we can bring out seven more men armed with rifles. The four operators of the Tommy guns are good men and know how to handle their weapons. Two of them are retired policemen. The local police lent us the Tommy guns."

"That's fine, Captain," says Colonel Doughfoot, "from all reports, Tommy guns have been found to be very effective weapons against parachutists. You and your men can be of great assistance. However, I am just now en route to reconnoiter the airport area and so am unable to give you missions now. If you will issue instructions to have your men assembled here in Jonesville by dark tonight, and you be at the bridge ½ mile west of town at 6:00 o'clock, I'll have a messenger meet you there and guide you to me. By that time I'll have instructions for you."

Colonel Doughfoot, having selected the route for his reconnaissance from the contoured map of the area which

had been provided him, proceeds west along the road running past the northern boundary of the airport. As he rides along, observing the terrain on either side of the road, he finds himself once more considering his basic problem—in view of the known technique employed by the Japs, how best to dispose troops and weapons to offset the advantages which accrue to their parachutists and to capitalize on their disadvantages.

The ability of parachutists to land simultaneously in two or more areas, separated by considerable distance and on any or all sides of their objective, requires: that observers be posted to keep all probable jumping areas under surveillance; that large groups must be disposed so as to enable them with little or no movement to take parachutists under fire while they are still in the air; and, a mobile force, or forces, capable of attacking and destroying any groups which may succeed in landing and establishing themselves on the ground. It would seem that a disposition similar to an outpost with observers, outguards, supports and one or more mobile reserves best fulfills these requirements.

Since any such defense results in a considerable dispersion of available forces, a well planned, efficient and speedy system of communications must be established, utilizing all available means, to enable the commander to exercise control.

Finally, the speed of an airborne force requires that advantage be taken of all existing warning systems.

By the time the party reaches the point where the road crosses the saddle north of Hill *601-d*, Colonel Doughfoot has made his decision to adopt this type of defense. He leaves the road and proceeds cross country to the edge of the woods on the nose extending west from Hill *601-d*, where he stops the car and dismounts. The remainder of the party, which has followed, likewise dismounts, and the officers join the Colonel. The vehicles are scattered under cover in the edge of the woods.

After a brief description of the type of defense he proposes to adopt, the Colonel continues:

"Owing to the limited mobility of parachutists after they have landed, and the short period of time they have available to capture their objective before they lose the advantage of surprise, I believe they will attempt to land fairly close to, but not on, their objective. Likewise, while they can land in fairly wooded or broken terrain, their landing casualties in such areas are heavy, so I think they will attempt to land in open areas near defiladed positions in which they can assemble. On my reconnaissance, I shall be primarily concerned with determining the localities which look like suitable jumping areas, those which seem possible but less probable and those which would seem to be entirely improbable. Also I want to locate possible stretches of roads or areas where planes or gliders can be landed. Captain Shoot, I want you to select suitable areas for the emplacement of your battery from which you can place fire on the airport. Captain Deco, you look particularly for suitable locations for your weapons. We will go all the way around the airport and end up on that hill (pointing to Hill *601-d*). I will want your recommendations there. Lieutenant Know, you take this situation map, keep oriented thereon and as we proceed I will point out areas on the ground which I want you to indicate on the map."

The party then moves cross country back to the road, thence along the road to Hill *573* and the hill 500 yards west thereof. After brief stops at each, they proceed to RJ 550-B, thence via the Worthington Turnpike to Newton Bridge; cross country, south of the stream, to Fellton Bridge; after crossing the bridge, cross country again via Hill *576* to Hill *584-d*, and along the ridge east of the airport to Hill *601-d*. En route, the Colonel makes brief stops at various points affording good observation and indicates to Lieutenant Know localities which appear to be advantageous jumping areas for parachutists. The Lieutenant indicates these on the map.

While on his reconnaissance, Colonel Doughfoot finds that Worthington Turnpike, paralleling the creek on the west side of the field, is a four-lane highway with concrete surface. Other roads indicated on the map by two solid lines are macadamized two-lane roads. All remaining roads are narrow, with clay or gravel surface. On the Worthington Turnpike there are three stretches which might be used for landing planes or gliders, but which could be readily neutralized by the placing of three or four obstacles. Long stretches on the Fellton Bridge-Jonesville road and on the Page Bridge-Jonesville road must also be blocked. Except on the airport, trees are located as indicated on the map. Other open areas on the map are now covered with scattered seasonal growth, four to six feet high. All streams are fordable by men, wheeled vehicles and tanks.

Having dismounted on Hill *601-d*, the Colonel directs Lieutenant Know:

"Battalion headquarters will be established in the wooded ravine west of this hill.

"I want you to find the regimental command post of the antiaircraft artillery regiment whose guns are emplaced in this area. Locate the nearest point where we can tie in by wire with their warning system and ascertain if we will be able to listen in on their radio warning net with our radio. Take one of the messengers with you in the ¼-ton truck. Leave him at the road junction ¼-mile southwest of Jonesville where the other commanders are to report at 4:30. He will guide them to me here. You will return here."

Calling Sergeant Draw (the topographic draftsman) to him, he hands him the situation map, on which various areas have been marked with a small parachute, together with nine of the unmarked maps and directs:

"Sergeant, I want you to copy on these maps the data shown on this situation map. Work under that tree there (pointing). I will give you the additional information to complete the operation map in a few minutes."

He then discusses with Captains Shoot and Deco the employment of their units and the recommendations which they make relative to the location and employment of their weapons.

Now, with his personal reconnaissance completed and the recommendations of his staff officers received, Colonel Doughfoot finds that as he had hoped he still has some time available before his unit commanders arrive. He sits down in the shade of a tree to consider some additional details of his problem and to prepare his notes from which he will issue his battalion order.

He has located those areas which he feels he must keep under observation, and has decided that his defense is to resemble, in many respects, an outpost. However, shall he detail one company to constitute the various outguards and furnish the observers, thereby keeping a large formed, reserve under his own control for use as a counterattacking force? Perhaps it would be better to divide the perimeter of the field into sectors, prescribing that each commander distribute his forces to protect the area assigned to him. Considering the wide dispersion necessary in order to cover the entire area this solution has many advantages. While motor transportation is available for moving a formed reserve, it is doubtful whether enemy bombers will permit the movement of a motor column during daylight. Consequently, it may be impossible to employ a central reserve which has been held out. By splitting a reserve into three parts, at least one of these should be able to attack any hostile landing by a rapid advance across country on foot. Again, prior to the attack the enemy intelligence service will use every resource under its command to obtain information of the defensive dispositions. Thus, no matter where the reserve or reserves may be located, if discovered they will be heavily bombed. By splitting them up they are more easily concealed and each element may select one or more alternate positions. If these positions are changed frequently it may be possible to deceive the enemy as to where the reserves are located.

Should the weapons of the heavy weapons company be initially emplaced in firing positions or should they be held under cover with a view of moving them into previously selected positions, once the attack is launched? If emplaced in advance, there is every probability that they will not be in the proper position to support counterattacks. On the other hand if not emplaced initially, they may never be able to get into position in time to fire or participate in the phase of the action when their fires would be more effective, that is, during the actual descent of the parachutists and while they are attempting to organize.

If emplaced initially, the heavy machine guns can deliver observed fire up to approximately 2,000 yards. Suittable targets would be transport planes which have leveled off to discharge parachutists or to land, pursuit and light bombardment planes protecting troops transported by air, and planes and troops on the ground.

The 81-mm mortars are not suitable for antiaircraft fire but they can be used to great advantage against planes which have landed and against areas in which parachutists or air landing infantry are assembled, particularly such areas which are defiladed from the fire of other weapons.

The 37-mm antitank guns cannot be effectively employed against targets in the air. In the initial stages of the hostile attack, at any rate, parachutists will have no mechanized vehicles. They may, however, attempt to land transport planes on the field and against these the antitank guns should be particularly effective.

Then there is the battery of artillery. If it is emplaced near the field for direct fire and the enemy attempts to land planes on the field, the rapid, direct fire of this battery should be devastating and decisive. However, if so emplaced, it must be carefully concealed and its fire withheld for this final decisive phase of the attack. Otherwise, it will be discovered quickly and destroyed by hostile aviation. It may be emplaced at some distance from the field and thus escape the possibility of discovery and destruction by the initial preparatory bombardment. With effective mobile

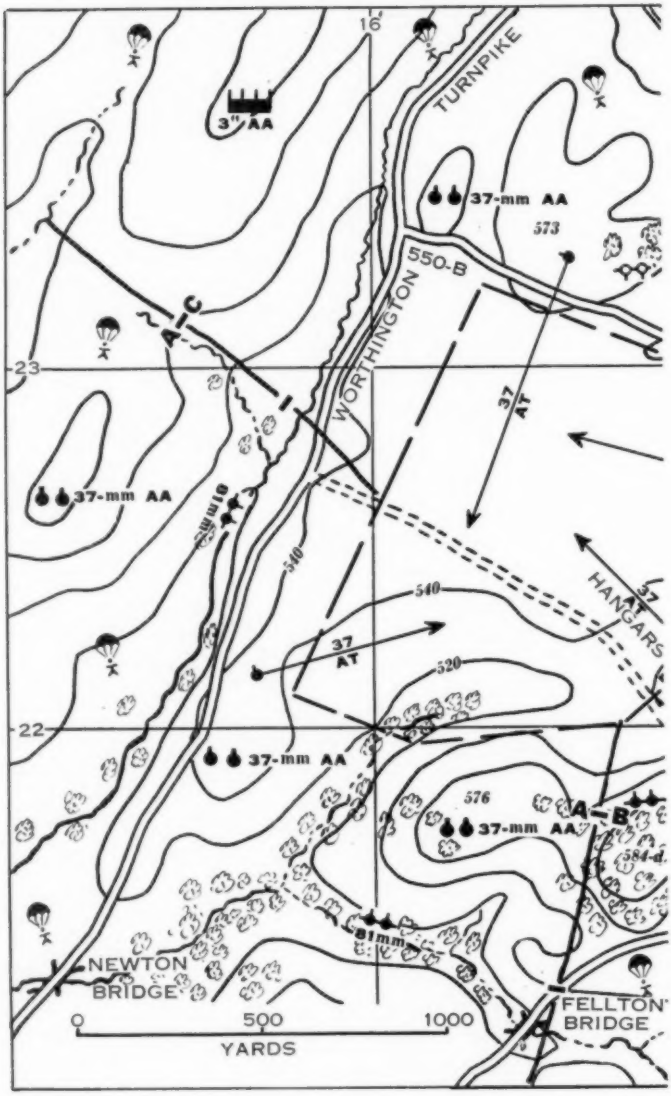
observation posts the battery should then be able not only to place effective concentrations on the field but also fire on hostile assembly areas. However, unless infantry troops are stationed to defend the battery, the enemy may drop a few parachutists near it, once it is discovered, and quickly capture or destroy it.

Then the scout cars—since the area which can be kept under observation by the ground observers is restricted, the scout cars are invaluable for patrolling the roads beyond the view of the observation posts. While their armor is insufficient to protect them from antitank weapons, it should be effective against the weapons with which parachutists are armed during and immediately after descent. They may easily, therefore, overrun small parties of parachutists attempting to establish road blocks. They can also be of great assistance in covering or screening the movement of reserves.

Finally the tanks—whatever disposition is made of these weapons, if their location is discovered, enemy supporting aircraft will make every effort to destroy them. Any attempt to employ these tanks as a unit in a counterattack will probably result in the concentration upon them of all available hostile aircraft. On the other hand if they are scattered and very carefully concealed, one of them reaching a jumping area or assembly area should, with its great fire power and crushing action, be able to disrupt completely the forces therein.

As he considered each point, Colonel Doughfoot made notes for his order and whenever possible indicated his decision graphically on the one copy of the map which he had retained. He then handed this map to Sergeant Draw and directed, "Add this data to the maps you have completed and label them 'Operation Map No. 1'. I want nine of them as soon as you can complete them."

By the time three copies are completed, the unit commanders arrive, guided by the messenger. The operation maps are handed to the three rifle company commanders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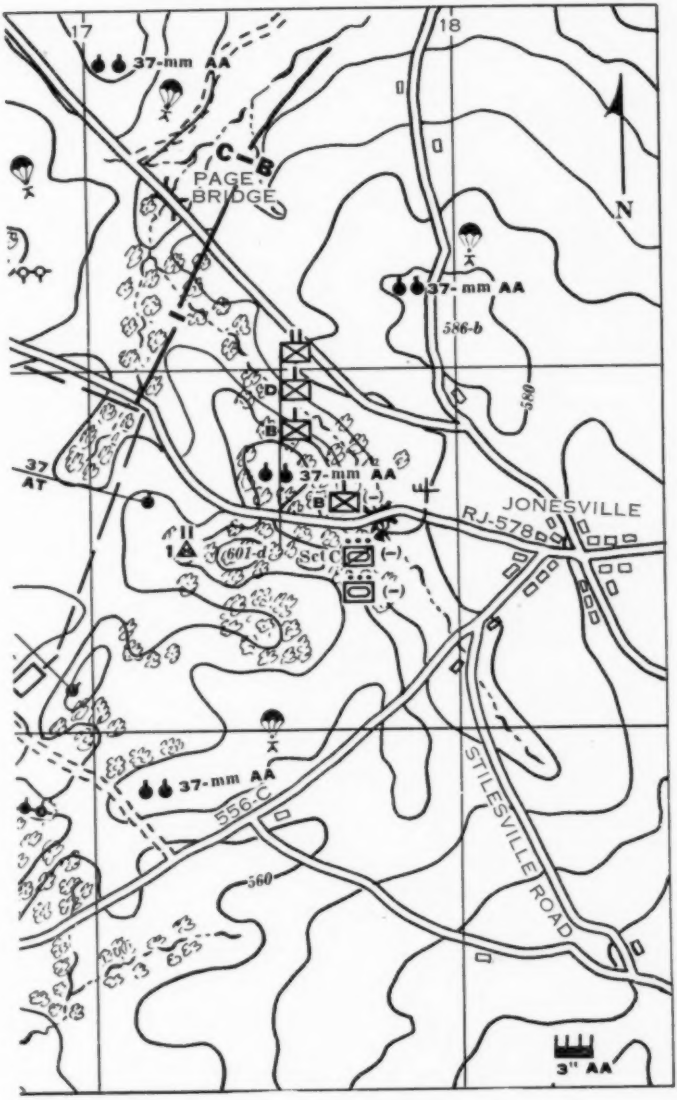


FIGURE 2.—Operation map given to company commanders.

and the remaining officers directed to distribute themselves so that each one can see a map.

After orienting the officers on the ground, the Colonel issues the following oral order:

"Take notes.

"The Japanese have reached a line about 35 miles from here. They have available a large number of parachute and air landing troops. An airborne attack against this airport is expected in the near future.

"Corps antiaircraft artillery is located in the area as shown on the operation map.

"This battalion, reinforced, will defend the airport against airborne attacks.

"Rifle companies, each with one section caliber .30 machine guns from Company D and one light tank attached will defend the areas indicated on the operation map. Not to exceed the equivalent of one platoon will be used in each area to establish observation posts and outguards to keep probable jumping areas, indicated with a small parachute on your map, under observation. These groups will take under fire immediately any parachutists attempting to land. In addition, Company B will provide one squad to furnish local protection for the 75-mm battery. Firing positions will be selected and occupied by heavy machine guns attached to companies which will permit these guns to fire on the air field and also permit their fire to cover the most favorable parachute jumping areas.

"37-mm antitank guns and 81-mm mortars will be emplaced as indicated on the operation map.

"The scout car platoon will patrol all roads within a radius of three miles of the airport. A sharp lookout will be maintained to detect landings beyond the range of our stationary observation posts. Any observed landings will be reported by voice radio in the clear.

"The tank platoon, less three tanks, in reserve, will take position as indicated on the map. All tanks will be dug in so that the top is flush with the ground, with an inclined ramp for rapid exit, and carefully covered and camouflaged.

"The 75-mm battery will be emplaced as shown on the map. Dummy emplacements will be constructed simultaneously as indicated.

"Standing type one-man foxholes will be dug for all personnel in both primary and alternate positions.

"Areas in close proximity to the antiaircraft installations shown on the map will be avoided.

"Every effort will be made to conceal all works and materiel. No tracks will be made in the open and vehicles will leave roads and enter wooded areas at carefully selected points which will not show on aerial photographs.

"Dummy works will be erected and imperfectly camouflaged.

"Ammunition will be stacked in small piles, in the vicinity of the primary, alternate and supplementary positions of all crew served weapons. Each such pile will be dug in and concealed.

"Kitchen trucks, organic trucks and those attached for the movement, will be dispersed and concealed within the company areas.

"Battalion Aid Station. See Map.

"Radio silence will be maintained until parachute landings are attempted.

"Command posts for all elements except Companies A and C—see map. Companies A and C report location selected by 8:15 PM tonight.

"The head of the motor column should reach the road junction ¼-mile southwest of Jonesville about 9:30 PM. Commanders, arrange to have a guide meet your organizations there. All commanders complete your reconnaissance and return here at 8:15 PM at which time I will have further detailed information for you.

"Sergeant Draw now has operation maps for those of you who did not receive them.

"Are there any questions?

"It is now 4:55 PM."

While Colonel Doughfoot was issuing his order, Lieutenant Know returned. He now reports: "Sir, one of the

battalions of the antiaircraft regiment has its command post in the house just south of Hill *586-b*. I have arranged for us to run a line to their switchboard and tie in with their warning system. The SCR 193 radio set with the scout car platoon can receive their radio warnings."

"Good work," says Colonel Doughfoot. "When the troops arrive, direct Lieutenant Commo (battalion communication officer) to get that wire in as soon as possible. Come along with me now. I'm going down to the airport to see the commander there. Sergeant Draw, you stay here and complete operation maps for the battalion staff.

"Private Lightfoot, you go down to the bridge there (pointing to the bridge about a half mile west of Jonesville) and meet Captain Davis of the State Guard. He should be there by 6:00 o'clock. Bring him here."

Arriving at the airport Colonel Doughfoot quickly acquaints Captain Wing, who is in command thereof, with his mission and inquires, "How many men do you have available in your detachment?"

"I have a detachment of 8 enlisted men and 10 civilians. The soldiers have caliber .45 automatics and the civilians have armed themselves with 4 revolvers and 6 U. S. rifles of various models. The civilians are all very loyal and are anxious and determined to do their part in keeping this field and its facilities out of Japanese hands."

"I am glad to hear that, for I have few men available to assist you here. I will depend upon you and your men to prevent these facilities from being captured. Do you have any experienced demolitionists in your detachment?"

"I have one sergeant who has been trained in demolition work and has had some experience, and one of the civilians has handled explosives in connection with mining operations. We have an ample supply of explosives and a blasting machine."

"That's fine. One of the principal objectives of the Japanese in attacking this airfield will be to get possession of the hanger and its facilities. They will be very careful in their bombing attacks not to hit it. We want to be sure

that no matter what happens they will never be able to use any of this equipment. I suggest that you have your men place inflammables in such positions that they may quickly set fire to everything which will burn here and that explosive charges be placed so as to effectively destroy everything of value which will not burn. It would be well to detail two men in advance whose specific job will be to set off the explosives, and others to ignite the fires. If you need any help with your preparations let me know.

"Captain Davis, in charge of the local State Guard, is assembling about 70 men to help us."

Colonel Doughfoot, after showing Captain Wing the location of his command post on the map, returns to Hill *601-d* where he finds Captain Davis awaiting him. Colonel Doughfoot greets him.

"Hello, Captain Davis. Let's sit down over here while I go over with you what I want you and your men to do.

"Provisions for the prompt emplacement of obstacles to help prevent enemy landing of transport planes, both on the field and in its vicinity will be of great importance. The landing field must be kept free of obstructions while our air force is still using it, but obstacles of all sorts should be emplaced thereon when the enemy has obtained such air superiority that we are no longer able to use it. Even while friendly planes are still using the field, preliminary steps to deny its use to the enemy should be taken. Concertinas, cheval-de-frise and similar obstructions that can be placed on the field should be prepared beforehand and conveniently located for future use. Wrecked vehicles, felled or uprooted trees should be placed on the edge of the field and by the side of any nearby roads suitable for the landing of planes. What suitable materials for obstructions can you obtain?"

"I know of at least six derelict vehicles which can be towed and used as obstructions. Also my men have been practicing the construction of road blocks and the preparation of various types of wire obstacles. We have located quite a lot of new and used wire of various kinds and can assemble it rapidly."

"That will be a big help in the very job I want you to do," says Colonel Doughfoot. "Have your men assemble all such material you can find. Have the derelict vehicles and any old farm machinery, or other obstacles that can be quickly moved onto the airfield, assembled near the hangar. I'll have men distribute them around the field.

"There are a number of wide straight stretches of road in this area where planes or gliders might be landed. Particularly the Worthington Turnpike along the western edge of the field as far south as Newton Bridge; the Page Bridge —Jonesville road for a half mile either side of the bridge; and the Fellton Bridge—Jonesville road. I would like to have your men assemble material at intervals along these stretches of road and be prepared to place them in position on the roads quickly. Inform your men that unless they have received orders to obstruct the roads earlier, the appearance of Japanese parachutists or transport planes will be the signal for them to do so at once. Post men with each such road block to defend it by fire in order to prevent removal by parachutists or fifth columnists.

"One more thing I want you to do. You and your men are familiar with this area. Keep all the roads in the area patrolled. Watch particularly for attempts to land fifth columnists by parachute during the night or to move them into the area singly or in small groups. Have your men pick up all strangers wandering around the country. In the event of an attack, instruct your men to block off this area completely. Let no civilians enter it from the outside.

"Keep me posted as to where I can reach you and drop by the command post, which will be in the ravine there (pointing), from time to time and let me know how you are getting along. Oh, yes, one thing more, be sure your men carry credentials so that my men can readily identify them."

Captain Davis replies, "You can reach me at any time through the office of the village constable in Jonesville. I'll get my men to work at once and be back here sometime tonight to report progress."

By the time he is finished with Captain Davis, Colonel Doughfoot finds that by losing no time he will just be able to run into Jonesville in the hope of being able to get a hot meal and be back in time to meet his unit commanders.

Back on Hill *601-d*, by 8:15, Colonel Doughfoot finds that all commanders have reported and that the proposed location of the command posts of Companies A and C have been entered on the Operation Map. After telling the group to sit down and make themselves as comfortable as possible Colonel Doughfoot says:

"Since this is a very special type of operation and involves a relatively new type of enemy and a special technique of defense, I want to talk over with you some of the characteristics of airborne attacks so that you will understand exactly the procedure we shall follow.

"It is important that every member of your units be made familiar with certain characteristic procedures frequently used by parachutists. It is therefore very important that you pass on as much of the information I shall give you as possible to insure that everyone is familiar with it. In the training of parachute troops great stress is laid upon the importance of the actions of individuals and small groups. In meeting such an attack the results depend to an even greater extent upon the initiative and intelligent cooperation of individuals and small groups. The attacker may rehearse and plan his actions in detail for a particular operation, but the defender must be prepared for anything.

"The Japanese will make no effort to land troops until they have almost unlimited control of the air over this area and feel that they have softened up any possible resistance. It is very probable that by the time the actual landings are attempted our means of communication will be thoroughly disrupted. Each of you may, therefore, be very much on your own and for this reason it is important that each officer and man have an understanding of the procedure which is to be followed. I will go into that more fully in a few moments.

"Now for a few matters of parachute technique for which we need to be on the alert. Parachutes of different colors are usually employed. It is very difficult to determine just what these various colored parachutes denote. They are changed from one operation to another. Basically, the purpose of employing colored parachutes is for identification. Sometimes equipment bundles are indicated by colored parachutes, the color indicating either the type of equipment or the unit to which it belongs. Again the colored parachute may indicate a base point, the men rallying on that particular parachute after landing. In some instances the color of the parachute indicates the organization. By knowing these various possibilities the special significance of the colored parachutes in any operation may be quickly estimated.

"Prior to the actual attack, a few planes or even a single plane may pass over an area and drop one or more parachutes with dummies. This may be for the purpose of determining the wind conditions at the time in order to insure spot landings by troops who are to jump in that same general vicinity shortly thereafter, or a large number of dummies may be dropped for the purpose of deception. In order to gain surprise, transports may come in at dusk or at night at high altitudes, cut their motors, and glide to suitable altitudes for parachutists to jump. Fifth columnists may attempt to signal information and directions to the attackers. They may also spread rumors and false reports in an attempt to cause confusion and get us to reveal our dispositions. Incidentally, I don't think it is necessary for me to give you any instruction as to what to do with fifth columnists.

"Another expedient which may be used is the dropping of numerous small bombs in areas which do not seem to call for such bombing. This may indicate a prospective jumping area. The bombs being dropped are for the express purpose of creating numerous craters to afford cover for the parachutists who are to land in that area.

"It is important that every man understand that a parachutist is practically defenseless during his descent and

for a short period of time after landing. During this time his only means of defense are a pistol or a Tommy gun and a few grenades carried in his pockets. During descent he cannot employ these weapons effectively because of his rapid movement and the necessity of employing his hands to manipulate the parachute. This is particularly true during the last few seconds prior to landing, at which time both hands must be employed in manipulating his parachute.

"It is during this descent and the few moments immediately after landing when the parachutists are disengaging their parachutes, assembling and securing their arms and equipment, that they are most vulnerable. At this time seconds count and every man within range must act daringly and on his own initiative to destroy parachutists before they can secure their arms and take cover.

"Parachutists will attempt to take shelter in bomb craters, gullies, and any other depressions affording cover from flat-trajectory fire. The weapons with which they are armed are of relatively short range. These factors make hand grenades especially valuable for use against them. Beside those normally available to you in your ammunition train vehicles, I have arranged to secure an additional supply. Be sure every man has at least four.

"We must assume that parachutists will land in large groups of not less than 100 to 150 men. However, during the critical two or three minutes, a very small group of defenders can successfully create such havoc as to completely disrupt the carefully preconceived plan of operation of such a group. The few survivors must then be ruthlessly hunted down.

"Now let us go over the plans or operational procedures which will be followed by our various groups.

"During all hostile attacks by aircraft, every man is to take cover in a foxhole. However, it must be impressed upon all that each group must detail observers and that these men, in addition to the men posted as area observers, must assume such a position in their shelter that they can watch for parachutists or gliders. If all men keep their faces down during the aerial attack, gliders can land undetected.

"It may be well to mention another technique which has been employed by our enemies. Relatively small fragmentation bombs have been released simultaneously with parachutists from planes flying with the transport planes. These bombs fall faster than the parachutists and so explode very shortly before the parachutists reach the ground. This delayed bombing will deceive an unwary defender and permit the parachutists to reach the ground with few if any losses from small-arms fire.

"I have assigned each of the rifle companies an area of responsibility. Each of you company commanders is to post observers and small groups for the purpose of detecting and attacking immediately any attempted landing anywhere within your area. Each of you has your own weapons platoon and a section of heavy machine guns. Enemy transports will usually level off at an elevation between 400 and 1000 feet and cruise at about 90 miles per hour for about 30 seconds before jumping begins. Parachutists will usually jump at elevations from 350 to 750 feet. During this time our machine guns will open up with antiaircraft fire. The appearance of parachutists will be the signal for every man within range to open up on them with the exception of members of the reserves. Men in reserve will open fire only in the event parachutists attempt to land in the actual area which they are occupying.

"In connection with these reserves the enemy will make every effort to determine their location in advance in order that their dive and light-horizontal bombers may attack and destroy or immobilize them. Therefore, every possible precaution will be taken to conceal their location. Two or more positions will be selected with individual shelters provided in each and the reserve moved nightly from one to the other. Even if these locations are discovered, the Japs will never know where we are.

"Now, in the event of attempted landings in any one or all of the company areas, the reserves in the area or areas concerned are immediately released to the company commander who will employ them at once to attack these forces. Company commanders will not employ their reserves to

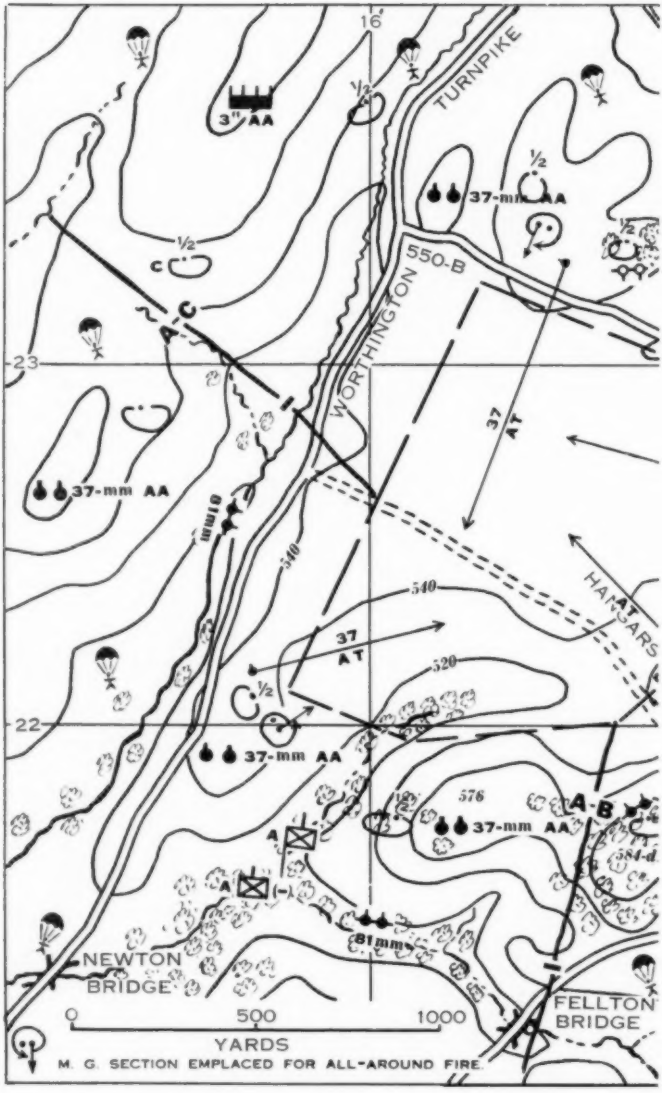
attack enemy landings outside the area assigned to them. It is very probable that landings will be attempted in at least two of these areas. If no landings are attempted in any one company's assigned area but are attempted in the other two, the formed reserve in the area which is not under attack will be employed only under my orders. I want to go over that again in order to be sure that you understand. If a landing is attempted in your area, you may employ your entire company at once, without waiting for orders from me. That means if landings are attempted in all three company areas, each company commander will employ his reserve at once on his own initiative. I will employ the mortars, the antitank guns, the tank platoon less three tanks, and the artillery so as to assist the unit which is most hardly pressed. In the event of an attack, the tank which has been assigned to each company will be employed immediately to move into the area of landings and overrun equipment bundles and destroy equipment and personnel attempting to assemble.

"37-mm antitank guns are emplaced so as to fire upon planes attempting to land upon the field. They are of little value otherwise but their fire can be most effective against planes stationary on the field or while they are moving slowly, either in landing or taking off.

"The 81-mm mortars are of no value against troops in the air. Their fire, however, can be most effective against troops trying to assemble or against air landing troops.

"While the parachutists are the spectacular part of the airborne attack, it is the air landing troops who are expected to accomplish the real mission of the airborne attack. Therefore, if we can prevent planes landing in this vicinity, we can undoubtedly accomplish our mission.

"The most effective weapon which we have against air landing infantry is our artillery. It is being placed in position for direct fire on the field and will withhold its fire until actual plane landings are attempted, except on direct orders from me. I cannot emphasize too strongly the importance of concealment of this battery. Under no circumstances


16
23
22
TURNPIKE
WORTHINGTON
550-B
3" AA
37-mm AA
37-mm AA
37-mm AA
37-mm AA
37-mm AA
37 AT
37 AT
HAMLARS
540
540
320
576
584-d
A-B
81 mm
NEWTON BRIDGE
FELLTON BRIDGE
0
500
1000
YARDS
M. G. SECTION EMPLACED FOR ALL-AROUND FIRE

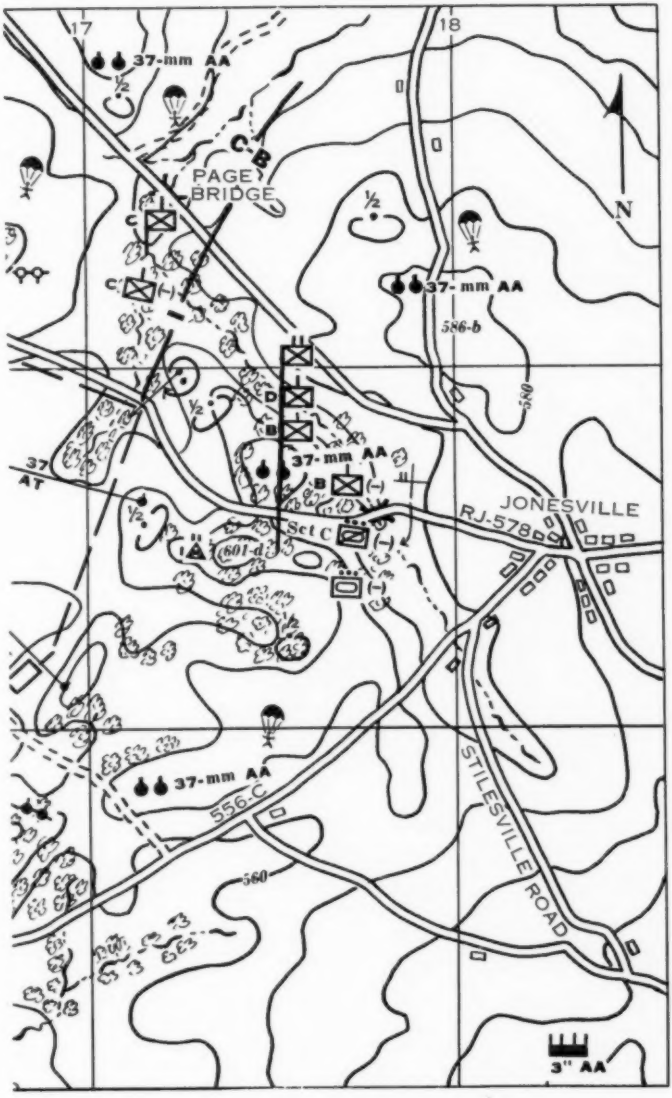


FIGURE 3.—Dispositions of the reinforced battalion, morning of the 9th.

will any civilian or soldier, unknown personally to our command, be allowed close enough to its location to discover it. You understand, Captain Shoot, that your battery is to remain silent, no matter what happens, unless you receive personal orders from me, or until planes attempt to land on the field. If that happens, the lid is off and you are to give them the works.

"In connection with the landing field itself, prior to any attempted attack, the Japs will make this field untenable for our own air forces. However, I feel that he will be very careful to drop few, if any, bombs on the field itself. He wants to use it. Therefore, a part of our problem is to be prepared to obstruct the field in such a way that he cannot land on it. Each company will prepare and assemble around the perimeter, obstacles which will be moved onto the field whenever our own air forces abandon it. If orders are not received to obstruct the field prior to the destruction of the hangar by the Air Corps personnel, that will be the signal for all concerned to place obstacles on the field. Units will install wire which will be provided and any other obstructions obtainable such as logs, large rocks, abandoned farm machinery, vehicles, and so on. Captain Davis of the State Guard is providing several junked vehicles, mostly trucks, which will be placed near the hangar tonight. He says while they are junk they can still be pushed on their wheels. Lieutenant Fleet (commander of the scout car platoon), I want you to detail men who will place these vehicles around the edge of the field tonight. They will be pushed onto the field and staked down when the time comes, by men from the company in whose areas they are located.

"It is now 9:00 PM; the battalion should be arriving soon. Be sure your guides are posted to meet your units. Let me have overlays tomorrow morning showing your dispositions. If there are no questions, that is all."

Morning of the 9th finds the reinforced battalion disposed as indicated in Figure 3. In addition, dummy works imperfectly camouflaged to improve realism, have been

prepared. Most of the morning is spent in checking positions, completing communication installations and constructing more obstacles, including a considerable number of wire concertinas, and cheval-de-frise. These are completed and placed around the edge of the field. All are carefully covered with branches of trees or otherwise camouflaged.

About 10:00 AM Colonel Doughfoot, at his observation post, receives a report from an observer stationed in a tall

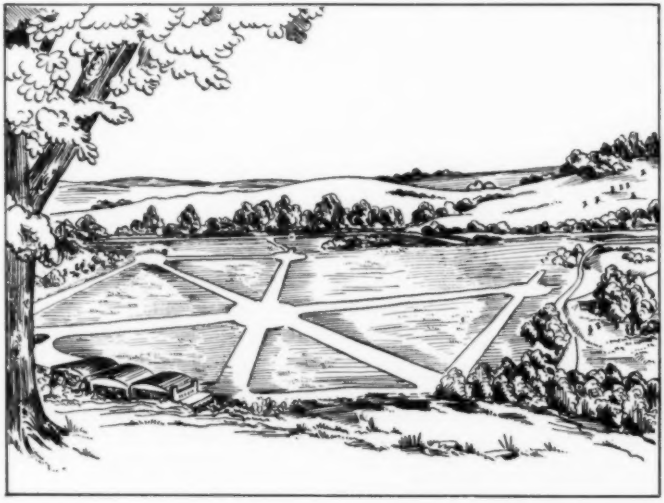


FIGURE 4.—Airport area as seen from battalion observation post.

tree nearby. The report states that the observer can plainly distinguish outlines of a machine gun emplaced on the hill north of the field; and that he can detect the presence of the outguards at (15.5-23.2) and (17.4-22.9). Also, continual movements by personnel of Company C on the eastern slope of Hill *573* are revealing the company's presence. The Colonel dispatches messages with corrective instructions at once.

Flights of observation planes over the area become more frequent toward the latter part of the morning. At about

1:00 PM, the low, sullen drone of heavy planes approaching from the northwest is heard. Shortly thereafter the antiaircraft artillery goes into action. A moment later high-level bombers are flying overhead and a heavy bombardment is being directed against antiaircraft units.

Reports begin to come in to the battalion command post and are forwarded to Colonel Doughfoot at the observation post. The antiaircraft units are sustaining losses in both men and materiel. The men of the battalion, in their foxholes, are relatively untouched. The bombing continues for half an hour and is followed by several flights of observation planes, which circle slowly overhead, apparently photographing. Toward the close of the afternoon a further and more intense bombardment takes place, accompanied by strafing and dive-bombing. A direct hit demolishes one of the machine guns at (15.8-21.95) and reports indicate that most of the corps antiaircraft installations are now out of action. Some of the enemy bombers make extremely low-level attacks. One is brought down between the creek and the northwest corner of the field.

At 7:10 PM a radio message is received from corps headquarters, which when decoded reads, "Newton, Page, Worthington, Fellton airports severely damaged. Air operations from Jonesville no longer possible." Colonel Doughfoot immediately dispatches messages informing all commanders of this development and orders that all obstacles be placed immediately at the previously selected locations on the field.

Morning of the 10th dawns at 5:20, to the accompaniment of heavy bombing attacks on dummy positions and emplacements. Reports disclose that the only corps antiaircraft weapon still in action is one of the 37-mm guns on Hill *586-b*.

At 5:40, enemy planes circling to the southwest are observed releasing smoke over an area south of Hill *584-d* apparently near Fellton Bridge. Soon thereafter the Colonel detects what appear to be several large planes maneuvering through the smoke near Hill *584-d*. He sends out a warning order: "Chute landings appear imminent and may already have commenced in vicinity of Hill *584-d*."

At 5:45 a report is delivered to the Colonel from Captain Davis, of the State Guard, stating that he has just received two phoned reports from civilian spotters that large numbers of parachutists, at least 100, have been dropped on the area just south of Fellton Bridge and are moving toward the field. At this time the sound of heavy firing is heard to the south in the direction the captain has indicated.

At 5:51 a report arrives from Captain Beco of Company B stating that one of his outguards southeast of the field has just received a story from two civilians, who dashed up in a car, to the effect that a large force of parachutists is advancing on Hill *601-d*, and that this force has by-passed most of the State Guard and overrun the remainder of our troops south of that point. This tends to confirm Captain Davis' report, but Colonel Doughfoot hesitates. It is at this time that seconds become so valuable. However, if parachutists have landed in the area of Company A and advanced into that of Company B, he cannot afford to employ his remaining reserve until there is a more definite indication that this is the main effort. Intense bombing is continuing but no parachutists have dropped elsewhere. He is unable to contact Company A and he prepares to direct a scout car to investigate. Suddenly a runner rushes up from the south side of the hill. He is panting and evidently has been running a considerable distance.

"Sir, Lieutenant Slick just got information from a civilian who was stopped by our outguards a few hundred yards east of the hangars. This man says a large number of parachutists are crossing the Fellton Bridge—Jonesville road and are going toward Hill *584-d*. He ran his car around by the side when he discovered them."

Colonel Doughfoot calls out, "Captain Deco, Lieutenant Crushem (tank platoon) come here." As they arrive the runner adds, "This man said he believed the parachutists were headed toward the northern slope of Hill *584-d* and that they threatened our artillery position on the high ground there."

"What's that?" the Colonel suddenly halts his instructions and queries the runner sharply. "Did you say the civilian said that?"

The runner is positive. "I heard the man telling Lieutenant Slick myself. He said he'd jumped in his car and drove cross country right around the flank of Hill *584-d* as soon as he saw them. Said he believed the enemy was headed right for the hill the artillery was on."

"That's enough." The Colonel quickly drops any idea of employing any part of his reserve. He directs the runner, "Return to your platoon and tell Lieutenant Slick to hold that civilian if he can still locate him. I want to find out how such a person can claim knowledge of our concealed battery location."

The Colonel glances up at the sudden appearance of three observation planes among the bombers and thinks he knows the answer. The battery has been concealed. No ground observer would have been able to see even the dummy works on Hill *573* much less to have known about the real location on Hill *584-d*.

Captain Davis arrives at this time and reports, "In checking the report of landings, I found that no one knows who phoned that report in. Two of my patrols report the dropping of dummy parachutists near Fellton Bridge but I have been unable to verify any other landings in the region where smoke was released. I doubt the authenticity of the original reports."

Colonel Doughfoot replies, "I surely appreciate your good work, Captain. This confirms my suspicion. An example of fifth column activity. Apparently the enemy weren't entirely satisfied with their operations against the dummy positions so they relayed this information to ground spotters in the vicinity. The latter must have been looking for the artillery position, and also attempting to cause a premature movement of the reserve."

Twenty minutes later, transport planes appear from the northwest and start dropping parachutists on areas both north and west of the field, all apparently within a half-mile of the edge. Colonel Doughfoot estimates about 140

men in the first wave. Two or three parachutists are observed firing Tommy guns while still in the air. Their effectiveness is greatly limited, however, by the twisting caused by the continued recoil and the necessity of manipulating their parachutes.

Fire is opened from all sides at the slowly descending targets. All automatic weapons within range fire at their maximum rate.

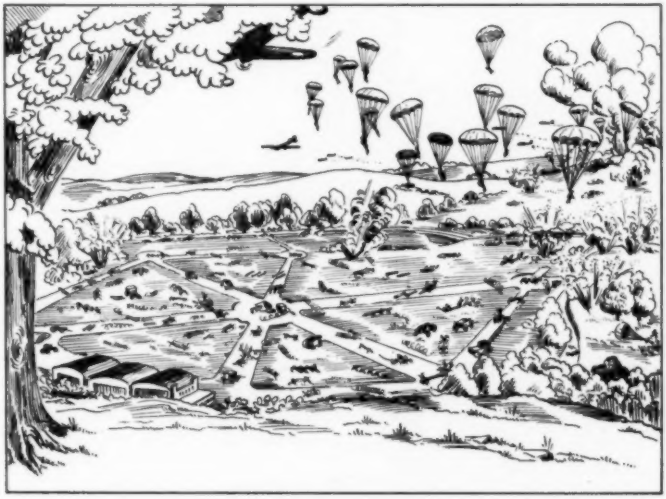


FIGURE 5.—Parachutists landing as seen from battalion observation post.

By 6:20 AM, despite casualties being inflicted by the outguards and other elements of the battalion, groups of approximately the strength of a rifle platoon each have landed and assembled in the following areas: the northern slope of the small hill just north of RJ 550-B; each of the two ravines leading into Hill *573;* along stream beds near the northeast corner of the field; and just west of the Worthington Turnpike about 1500 yards north of Newton Bridge. These groups are heavily engaging the outguards

which cover their location, and are starting to close in on the landing field.

The tank attached to Company A has been disabled by fire from enemy planes. The tank with Company C is in action on Hill *573*. The tank with Company B, and the two retained under battalion control, are still concealed in their original positions. Vehicles of the scout car platoon, except one scout car with an SCR 193 radio set, are out on patrol.

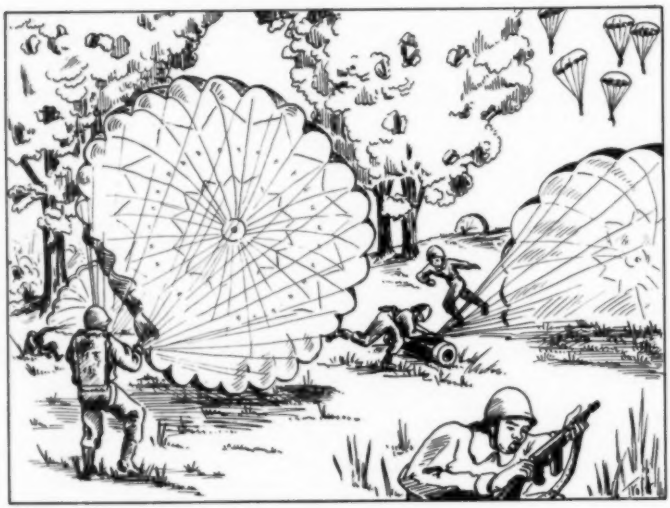


FIGURE 6.—Parachutists releasing harness, gathering equipment, and assembling under cover.

By 6:25, the parachutists who landed in the area of Company C together with those landing north of Newton Bridge have succeeded in overcoming all resistance on the western edge of the landing field and on Hill *573*. With no resistance on their front, they commence clearing part of the field of obstacles. They are being protected by heavy automatic fire from positions on Hill *573* and at the southwest corner of the field.

All contact with the command posts of Companies A and C has been lost. From the sounds of heavy firing coming from the wooded stream lines at the northeastern corner of the field, where the bulk of Company C was located, it is apparent that they are engaged in heavy hand-to-hand fighting and are unable to attack Hill *573*.

Several transport planes now appear from the northwest flying at an altitude of about 500 feet. It is evident that they are preparing to land. Colonel Doughfoot calls Captain Beco, Lieutenant Crushem, and Lieutenant Fleet, who have been observing the action from nearby foxholes and directs: "Lieutenant Crushem, the tank attached to Company B is released to you. Attack Hill *573* at once. Captain Beco with his company, less one platoon, will follow you as rapidly as possible. Move out.

"Captain Beco, take your company, less the platoon now engaged and recapture Hill *573*. Be prepared to hold it against attacks from the airfield or by additional parachute landings. Any questions? Move out.

"Lieutenant Fleet, take your scout car and locate Captain Aco or whoever is now left in command of Company A. Direct him to destroy the group of parachutists at the southwest corner of the field and to hold Hill *576* at all costs. Get back to me with a report on the situation there as soon as you can."

Meanwhile the three leading transports have leveled off and are approaching for a landing on the western edge of the field. Several heavy explosions from the direction of the hangars indicate that the destruction of facilities there is under way. As the planes approach, all machine guns remaining in action open fire on them. As the wheels of the leading plane touch the ground, the artillery opens up, as do also the two 37-mm antitank guns emplaced on the eastern side of the field. Two planes succeed in landing and brake to a quick stop emitting streams of troops who rush toward Hill *601-d*. Before a third plane can land, a direct hit carries away its undercarriage. It crashes, noses over and bursts into flame. A few survivors attempt to escape but are able only to climb out into a hail of machine-gun

fire. Automatic fire from three sides is directed toward the troops who are running across the field. Most of them are stopped before they reach its edge. Some, however, reach cover and set up their weapons. The first transport plane, attempting to take off immediately after unloading its occupants, is hit by 37-mm antitank-gun fire and disabled. It slews around with one wing caught against a concertina.

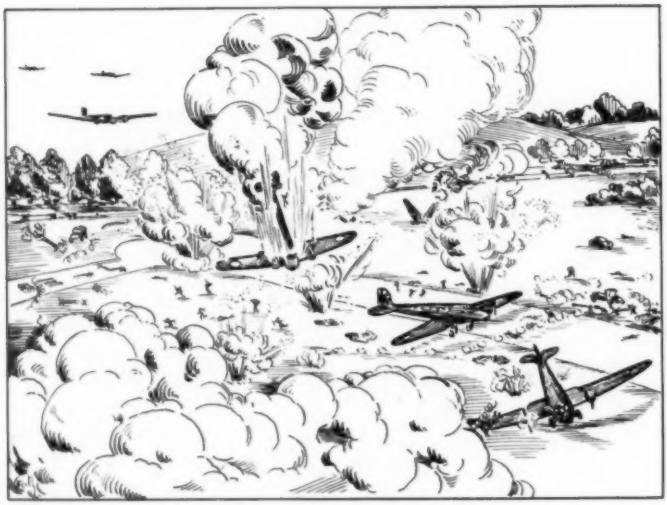


FIGURE 7.—Transport planes attempting to land, unload troops, and take off.

This sudden and apparently unexpected volume of fire confuses the landing troops. They continue their attempt to reach cover, vainly endeavoring to utilize what cover is afforded by the planes. The two 81-mm mortars south of the field now open up adding to the withering fire which disrupts the attempts of leaders to organize their forces. Two more planes land, moving carefully along a clear lane, lined with wrecked trucks, wire obstacles, and log piles. One scarcely comes to a halt before it receives an artillery hit demolishing it and most of its occupants.

A rocket shooting up from the enemy concentration on Hill *573* causes three more transport planes, which have leveled off to land, to veer away and make off.

From his observation post, Colonel Doughfoot sees the three tanks move rapidly up the eastern slope of Hill *573*. They soon silence the automatic weapons which had been emplaced thereon and, by cruising about firing occasional bursts of machine-gun fire, force the remaining parachutists to remain under cover of foxholes and other depressions. Soon the men of Company B can be seen advancing up the hill at a run taking advantage of the assistance of the tanks. One by one they hunt down and dispose of the remaining parachutists with grenades and bayonets. Those parachutists who attempt to run are shot in the back, no quarter being asked or offered.

Off to the southwest, heavy mortar fire is being placed on the group in position on the ridge overlooking the southwest corner of the field. After a short heavy burst of fire it ceases and a platoon of Company A can be seen closing in on the positions. Soon all resistance there ceases. The dive bombers, which attacked the artillery shortly after it opened fire, turn away and the attack is over, for the time being, at least.

However, while this attack has been defeated, it has disclosed his dispositions to the Japanese who will undoubtedly renew the attack. Therefore, units must be rapidly reorganized and new dispositions made at once.

As Colonel Doughfoot starts to leave his observation post to direct these new dispositions he turns and takes one last look at the airfield. As he notes the smouldering ruins of three of the transport planes and dozens of bodies littering the field, he grimly vows that the next attempt to seize it shall meet a like fate.

CHAPTER 2

A Course of Instruction for an Infantry Regiment in Defense Against Chemical Attack

History has shown that the German high command had no conception of the devastating effects of their first surprise attack, in 1915, in which they employed a cloud of chlorine gas. The use of toxic agents in the present war has not been verified. However, we know that both the Germans and the Japanese are prepared to use such agents.

If any one or all of our enemies elect to use chemical agents, they will undoubtedly use them in large quantities, in a vital area and with every effort to achieve complete surprise and to exploit to the fullest the demoralization which they hope will result therefrom.

The responsibility of commanders for providing security against chemical attack is stated in paragraphs 255-260, FM 100-5, Field Service Regulations. This responsibility includes the provision of individual and collective protective equipment, and the training of personnel in its use; an adequate warning system to alert the command when a chemical attack begins or impends; the location and the definition of contaminated areas; the decontamination of individuals, equipment, and occupied areas; the disposition of troops in combat to take advantage, as far as practicable, of terrain unfavorable for gas concentrations; and the avoidance or evacuation, to the extent possible, of gassed areas.

There has been a tendency in many units to limit the instruction of individuals to a few hours of training in gas mask drills. Although this type of instruction is necessary,

it is obviously only a very small part of the program; it covers only one item of the scope given in FM 21-40, Defense Against Chemical Attack. If an individual soldier is to act intelligently in securing protection during gas attacks, or if groups of individuals are to take proper measures for the protection of food, equipment, supplies, and the unit as a whole, then every soldier must know something about the general characteristics of the chemical substances that may be used. He must know the forms of gas attacks and the danger areas resulting therefrom. He must also be familiar with the individual and collective equipment and methods that may be used to secure protection against these attacks.

The following suggested program for unit training to be conducted subsequent to the mobilization training period, provides for a total of eight hours instruction, excluding periods combined with other training. It covers all of the essentials of the subject of the defense against chemical attack required by FM 100-5 and FM 21-40. It should be emphasized, however, that the training of a unit in this subject does not end with the completion of a short program such as is presented in this chapter. Training in the care and use of protective equipment, practical work in measures to be taken before, during, and after a gas attack, and exercises in tactical protection should be continued in training schedules from time to time throughout the training period.

In the conduct of any course of instruction, practical methods of presentation are preferable to theoretical. This is especially true of instruction dealing with chemical substances or war gases. In the average mind there is something mysterious about chemistry and chemical warfare. Or perhaps there is an idea that the subject is too technical for the average soldier to understand. This idea must be dispelled and the best way to dispel it is to make the instruction in defense against chemical attack just as simple and practical as possible. Some orientation is necessary, but time should not be wasted on lengthy explanations when some form of practical work or a demonstration can be used to present the same subject matter. If the practical work and demonstrations are well planned, the instructor can get

and hold the attention of the soldier and can make much more lasting impressions upon him than with long periods of explanatory instruction.

Practical methods of instruction are used in this program to the fullest possible extent considering the limitations on equipment and facilities that will exist in the normal infantry regiment. The suggested subject matter and the recommended exercises are quite elementary in nature. They are intended merely as suggestions. Many variations and amplifications of this material are possible, and for the training of many units, such variations and amplifications may be necessary. In all periods where detailed practical work is required of each individual, the instruction usually should be conducted by platoon. In the case of periods involving demonstrations, the instruction may be given to units as large as a battalion. The approximate time required for each period is indicated; the actual time will vary somewhat with the size of the unit receiving instruction and the time required to reach suitable training areas.

The course of instruction is divided into twelve periods as follows:

1st Period - 30 min.—General Characteristics of Chemical Agents.
2d Period - 30 min.—Review and Identification.
3d Period - 30 min.—Identification in the Field.
*4th Period - 60 min.—Demonstration - Forms of Gas Attacks.
5th Period - 60 min.—Care and Use of the Gas Mask.
6th Period - 30 min.—Review and Gas Mask Drill.
7th Period - 30 min.—Gas Mask Drill and Use of the Gas Chamber.
8th Period - 30 min.—Repair and Disinfection of Gas Masks.
*9th Period - 30 min.—Demonstration - Other Individual Protective Equipment.
.....Wearing the Gas Mask During Other Training.
(Combined with other training.)

*Demonstrations may be given to battalion groups.

*10th Period - 60 min.—Demonstration - Use of Collective Protective Equipment.

*11th Period - 30 min.—Demonstration - Protective Measures Before, During, and After a Nonpersistent Gas Attack.

*12th Period - 60 min.—Demonstration - Protective Measures Before, During, and After a Persistent Gas Attack.

.....Tactical Protection (Combined with other tactical instruction).

FIRST PERIOD

General Characteristics of Chemical Agents—30 minutes.

Equipment Required: Blackboard; small bottle each of liquid smoke**, gasoline, and light lubricating oil; Gas Identification Set, Instructional M1***; clip of cartridges, previously corroded by the application of "Clorox."

Instructional Hints:—Initial instruction in this subject should be presented largely by conference methods. Weather permitting, it should be conducted outdoors. A simple chart as shown in Figure 8 should be prepared on a blackboard.

References:—For instructions for the use of the Gas Identification Set, see paragraph 62, FM 21-40.

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*Demonstrations may be given to battalion groups.

**May be obtained from Division Chemical Warfare Officer.

***Issued to each post, camp,or station, on the basis of 1 per each regiment or separate battalion stationed thereat. (T.A. Posts, Camps and Stations May 7, 1941.)

CHEMICAL AGENTS

CLASS	*TYPICAL AGENT*	(1) *ODOR* and (2) *COLOR* in *FIELD*	*EFFECTS ON BODY*	*PERSISTENCY*
Nonpersistent Gas	Phosgene (CG)	(1) New cut hay or cut corn. (2) Colorless gas*	Immediate. Coughing, choking; irritates lower lungs.	In open, 10 min. or less.
Persistent Gas	Mustard (HS)	(1) Garlic. (2) Liquid, dark brown; gas, colorless.	Delayed 2-4 hrs. Blisters skin, causing severe sores.	Summer, 4-5 days; winter, weeks.
	Lewisite (M1)	(1) Geraniums. (2) Liquid, dark brown; gas, colorless.*	Delayed 1-2 hrs. Blisters skin; body poisoning.	Summer, 1-3 days; Winter, weeks.
Irritant Gas	Adamsite (DM)	(1) None. (2) Canary-yellow smoke.	Immediate. Sneezing, headache, nausea, debility.	In open, 10 min. or less.
	Tear Gas Solution (CNS)	(1) Fly paper. (2) Liquid, colorless; gas, colorless.	Immediate. Irritates eyes, nausea, vomiting.	Summer, 1-2 hrs; winter, 6-24 hrs.
Smoke	White Phosphorus (WP)	(1) Matches. (2) Smoke, white.	Smoke, none. Particles cause fire burns.	1-2 minutes.
Incendiary	Thermit (TH)	(1) None. (2) Molten metal.	Fire burns.	2-10 minutes.

* Heavy concentrations can be seen at point of release or burst.

FIGURE 8.

SUGGESTED CONFERENCE

Chemical warfare agents differ greatly in their behavior in the field and in their action against one's body. At normal temperatures, some of them are true gases and are dissipated quickly when released in the open air. Others remain effective for a considerable period of time after release. Some of them are injurious only when they are breathed, while others cause injury to any portion of the body with which they come in contact. As brought to the battlefield, loaded in shells or other containers, all chemical agents are in a liquid or solid state. Some vaporize immediately upon their release and form gas or smoke clouds; some vaporize slowly; others require the application of considerable heat for their dissemination and hence are used only in burning-type munitions. They are all classified, however, in five general groups as shown on this chart, viz., (1) nonpersistent gas, (2) persistent gas, (3) irritant gas, (4) smoke, and (5) incendiary.

A nonpersistent gas is one which when released in the field is rapidly dissipated from the point of release by the action of the wind. Nonpersistent gas is loaded into a shell, under pressure, as a liquid, but when the shell bursts the liquid changes into a gas almost immediately. The action of a nonpersistent gas can be illustrated by this liquid smoke. (*The instructor pours about four ounces of liquid smoke on the ground, being careful not to get any of it on his hands or clothing.*) You will notice that when this liquid substance is exposed to the air, it changes almost immediately into a white smoke. It then drifts with the wind, spreading and getting thinner as it travels. The action of nonpersistent gas is almost exactly the same—it changes almost instantly into a gas. However, the gas is almost colorless, but it is in the air just the same, and it drifts away from the point of release with the wind in much the same manner as smoke.

A persistent gas is one which, when released in the field, will remain in effective concentration at the point of release for periods varying from several hours to several days. The action of persistent gas can be illustrated by the

action of gasoline or light motor oil. If you take this gasoline and pour it on the ground (*the instructor does this*), it will completely evaporate in an hour or two. You can't see any gas coming from this gasoline on the ground, but if you will get closely downwind from it you can smell the fumes. Some gases act exactly like that; others are more persistent. We can illustrate the action of the more persistent kind by this light motor oil. If we pour this light motor oil on the ground, you can see it, especially on vegetation. The oil will remain on the ground for several days before it evaporates, but during that time, it is constantly giving off vapor. If you get closely downwind from it, you can smell the vapor. Some chemical agents are very much like this motor oil, although they may not be quite so persistent.

An irritant gas is one which, in concentrations producible in the field, is not lethal but will cause sneezing, coughing, lacrimation, or headache followed by nausea. Some gases cause only temporary casualties. Common tear gas is a typical example of this kind of agent. It causes intense irritation of the eyes, but in a short time after you get out of it the effects disappear.

A smoke is a chemical agent whose principal effect is to produce an obscuring screen. The smokes are used to deny to the enemy information of activities on the battlefield, or to reduce the effectiveness of hostile fire.

An incendiary is an agent whose principal effect is to ignite inflammable substances with which it comes in contact. In other words, the incendiaries are agents used to set fire to material that will burn.

All chemical warfare agents fall into one or another of these five classes. There are many agents of each class. If we learn how one typical agent of each class will act in the field, we will have a very good idea of how any other agent in the same class will act. If we learn how to secure protection against the action of a typical agent of each class, we will know quite well how to secure protection against all other chemical agents that might be used in war.

A typical agent of the nonpersistent class is phosgene, which in concentrations producible in the field may cause death. Phosgene acts directly upon the lungs, irritating them and cutting down the supply of oxygen to the blood; the degree of injury caused by it depends upon the concentration and the length of time of exposure. For example, a 10 minute exposure to a concentration of 1 ounce of phosgene in 1,000 cubic feet of air—or 1 ounce of phosgene in an air space 10′ x 10′ x 10′—will cause death. If the concentration is increased to 2 ounces in 1,000 cubic feet of air, a 5-minute exposure will cause death. Phosgene is quite toxic; just a few breaths of either of these concentrations will produce a serious casualty, although it may not result in death.

The action of phosgene is immediate. The first effects are choking, coughing, and difficulty in breathing. This is followed by pains in the chest and other symptoms quite similar to pneumonia.

The odor of phosgene is similar to that of fresh-cut corn or new-mown hay. A sample will be passed around to enable each man to get the odor of this agent. As the sample gets to you, hold it in the left hand. With the right hand, remove the stopper from the bottle. Then, holding the mouth of the bottle about six inches from the nose, fan the vapor toward the nose, sniffing gently. As soon as you have gotten the odor, pass the bottle to the next man. (*The instructor demonstrates the use of the sample and passes it to a member of the group.*)

When released in the field, phosgene drifts with the wind, like smoke. Since it is 3.4 times as heavy as air, it tends to hug the ground and to flow into trenches, ravines and other depressions. In such places, especially if they are wooded, the gas may remain in effective concentration for 20 to 30 minutes; but in high, open ground it is usually dissipated from the point of release in 10 minutes or less.

Phosgene has a vigorous corrosive action on metals—especially in the presence of moisture. If a strong concentration of phosgene comes in contact with cartridge cases or the working parts of weapons, they may corrode to such an

extent that they will not function unless remedial action is taken. (*Instructor holds up corroded cartridges.*) The action of phosgene on cartridges would be similar to the effects on the clip I have here. These cartridges would not function in an automatic weapon.

A typical example of persistent gas is mustard, which in concentrations producible in the field, may cause death. Mustard gas is an oily, slowly evaporating liquid, characterized by its vesicant, or blistering action. When liquid mustard comes in contact with the skin, it will produce blisters which later break down into very severe, slow-healing sores. Even one drop of mustard gas will produce a blister the size of a quarter or a half-dollar, and sometimes even larger. The vapor of mustard gas also will penetrate ordinary clothing and produce blisters on the body just the same as the liquid—perhaps not quite as severe—or, if breathed, it will irritate the lungs, causing a lung casualty just the same as phosgene will. As a matter of fact, the vapor of mustard gas is four times as toxic as phosgene. However, in the case of phosgene, casualty effects take place almost immediately; in the case of mustard, the principal casualty effects are delayed from 2 to 4 hours after exposure.

The odor of mustard gas is quite strong and distinctive; it is similar to the odor of garlic. I will pass a sample of this agent around to you. Sniff it in the same manner as you did the phosgene. (*A sample of mustard gas is passed to the class.*)

At ordinary temperatures mustard gas is a liquid. When released in the field, some of it passes immediately into the atmosphere as a vapor, and drifts downwind just like any other gas. The greater part of it, however, is deposited on the ground and vegetation in liquid form. There it will remain in effective concentration for periods varying from 4 to 5 days in summer to 2 or 3 weeks in winter. During this time, this liquid is constantly giving off vapor, the amount of vapor varying with the temperature. Any person passing through an area that has been shelled with mustard gas will probably become a casualty either by contact with the liquid

or by exposure to the vapor. Any person passing closely downwind from such an area, especially on a warm day, is also likely to become a casualty from exposure to the vapor alone.

Mustard gas is very penetrative and will contaminate almost anything with which it comes in contact. It quite readily goes through the leather of shoes. It will penetrate wood, and to some extent will enter the pores of metals. Clothing and equipment contaminated with liquid mustard are dangerous to use until decontaminated. The decontamination process is slow and difficult.

Lewisite is another agent of the persistent class which should receive special attention. Lewisite will cause blisters on the body just the same as mustard. Its action is a little quicker than mustard; it takes effect in from one to two hours. Since Lewisite is a compound of arsenic which in liquid form is readily absorbed by the skin, body poisoning results from contamination of the skin with this agent. Lewisite has the very characteristic odor of geraniums. (*The instructor passes a sample of this agent to the class.*)

There are two general types of irritant gases. An example of the first type is Adamsite. At normal temperature, Adamsite is a solid. When this solid is heated, it gives off a canary-yellow smoke which, in heavy concentrations, can be seen in the air. When this smoke is inhaled, it causes irritation of the nose and throat. This is followed by sneezing, severe headache, and nausea. If a person gets enough of it into his system, complete debility for a period of about 24 hours will result. Adamsite has no definite odor, but one can tell when he is in it due to the irritating effect to the nostrils. (*A sample of the agent is passed to the class.*)

An example of the other type of irritant gas is tear gas solution, which is a mixture of common tear gas and the vomiting gas—chlorpicrin—which was used in World War I. The vapors rapidly given off from this solution cause vomiting and intense irritation of the eyes. Tear gas solution has a sweetish odor something like Tanglefoot flypaper. This odor comes from the chlorpicrin in the solution. (*A sample of chlorpicrin is passed to the class.*)

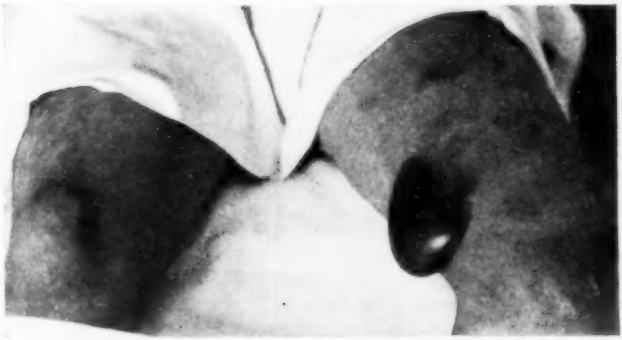

FIGURE 9.—Twenty-four hours after contact with Mustard Gas.

FIGURE 10.—Four days after contact with Mustard Gas.

None of the irritant gases, in field concentrations, will cause death.

There are many different kinds of smoke. The standard smoke for war use is white phosphorous, a solid which burns spontaneously upon exposure to the air, and produces a very dense, white smoke. The smoke is entirely harmless, but the burning particles of white phosphorous thrown out from a bursting shell are, in effect, liquid fire and any person caught within the radius of burst of one of these shells is very likely to get burned. The burns produced by particles of white phosphorous heal quite slowly due to the systemic poisoning produced by the absorption of phosphorous. The odor of white phosphorous is similar to that of matches.

A typical example of the incendiary class is thermit, a mixture of iron-oxide (iron rust) and powdered aluminum. When ignited with a suitable starting agent, this mixture burns at a temperature of about 4,500 degrees Fahrenheit, making it a valuable means for the destruction of materièl which is to be abandoned. Since thermit burns very rapidly, it is not a very effective incendiary agent. However, it is used as a starting mixture for a magnesium case bomb, the thermit igniting the magnesium case, which burns from 10 to 15 minutes. Since thermit provides its own oxygen, it cannot be extinguished by smothering. Water thrown on burning magnesium produces an explosive action and a pyrene liquid produces a toxic gas.

SECOND PERIOD

Review and Identification—30 minutes.

Equipment Required:—Gas Identification Set, paper, and pencils.

Instructional Hints:—This period should start with a review of the subject matter presented in the first period. This review may well be in the form of an oral quiz. For practical work, using a Gas Identification Set, test the ability of the members of the class to recognize the various agents by odor. For this instruction, cover the symbols of the respective bottles with numbers, then have the students smell the samples and write down the names of the agents represented by the numbers. The instructor then checks the answers to determine the proficiency obtained by the group.

THIRD PERIOD

Identification in the Field—30 minutes.

Equipment Required:—Gas Identification Set, Detonation M1*, electric detonators, wire, and exploder box.

Instructional Hints:—This instruction should be conducted outdoors on terrain at least 200 yards from other activities. It should consist of a brief review of the characteristics of typical agents with emphasis on the means of identification in the field and a test of the students' ability to make identification in the field. After each agent has been exploded, the members of the group should be required to name the agent.

Since the sense of smell becomes considerably dulled after smelling one or two of the agents, a break of about 10 minutes should be given after two of the agents have been detonated.

References:—See paragraph 63, FM 21-40 for instructions on the use of the detonation set.

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* Issued to post, camp or station on the basis of 1 set for each 500 officers and men stationed thereat. (T.A. Posts, Camps and Stations, May 7, 1941.)

FOURTH PERIOD

Form of Gas Attacks—60 minutes.

Equipment Required:—Blackboard, 3 smoke pots, 4 tin cans filled with liquid smoke**; 4 tin cans filled with simulated mustard**; 1 chemical land mine** (simulated mustard); 1 quart simulated mustard or light motor oil; 8 electric detonators and an exploder box.

Instructional Hints:—A demonstration set up similar to that shown in Figure 11 should be prepared in advance, on terrain 400-500 yards distant from other activities. If possible, an area should be selected which will permit the class to be assembled at different points, in the event the direction of the wind changes.

A simple chart, as indicated in Figure 12, should be placed on a blackboard in front of the class. The instructor should fill in the last column, *"Requirements for Protection,"* as he discusses this phase of the instruction.

SUGGESTED CONFERENCE

If we expect to use protective equipment properly and to take proper protective measures before, during, and after a gas attack, it is necessary that we know something about the forms of gas attacks—how these attacks may be projected by the enemy, the danger areas resulting from them, the equipment and measures necessary to secure protection from them. There are four general forms of gas attacks as indicated on this chart, viz., (1) cloud attacks, (2) shell attacks (3) static dispersion and (4) air spray attacks.

The term "cloud gas attack" is used to designate a type of gas attack in which the chemical agent, having been released within friendly forward positions, is carried by the wind into the enemy positions. The chemical agents most commonly used in this type of attack are nonpersistent gases. The weapon most commonly used is the portable chemical cylinder.

** Liquid smoke, simulated mustard, and chemical land mines should be obtained from the division chemical warfare officer.

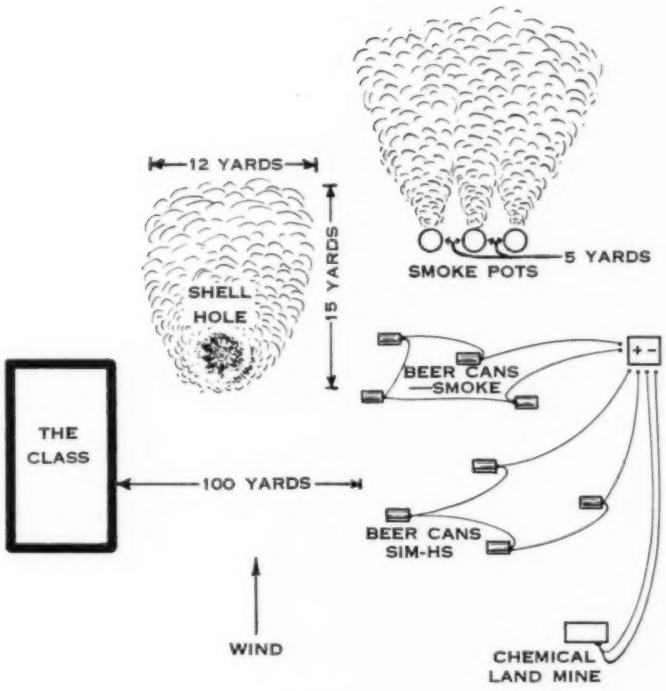


FIGURE 11.—Demonstration setup for fourth period.

Form	Agents Used	Means of Dispersion	Requirements for Protection
a. Cloud Attacks	(1) Nonpersistent Gas	Portable cylinders; Candles.	Warning system and gas masks.
	(2) Irritant Gas		Warning system and gas masks.
b. Shell Attacks	(1) Nonpersistent Gas	Projectors; mortars; artillery.	Warning system and gas masks.
	(2) Persistent Gas	Mortars; artillery; bombs.	Warning system or reconnaissance; gas masks and protective clothing; decontamination; alternate positions.
	(3) Irritant Gas	Mortars; artillery.	Warning system and gas masks.
c. Static Dispersion	(1) Persistent Gas	Chemical land mines; Spraying devices.	Reconnaissance; gas masks and protective clothing; decontamination; alternate routes or positions.
d. Air Spray Attacks	(1) Persistent Gas	Airplane spray tanks.	Warning system; gas masks and protective clothing; decontamination; alternate routes or positions.

FIGURE 12.—Forms of gas attacks.

The portable chemical cylinder used in our army weighs 65 pounds, of which about 35 pounds is nonpersistent gas. These cylinders are transported as far forward as possible by motors and from this point to the front lines on the backs of soldiers. The cylinders are used only in large numbers, being installed in the front lines at the rate of about one per yard of front. A favorable wind blowing toward the enemy is essential to their successful use. They are usually fired at night.

When the valves of the cylinders are opened, internal pressure forces the liquid agent into the air where it instantly changes into a true gas and drifts with the wind, like smoke. As the huge cloud moves along, it spreads slightly and tends to move along valleys rather than along ridges, even though the valleys may run at considerable variance with the wind direction. In high, open places, the gas is dissipated in 10 minutes or less. In low places, especially if they are wooded and sheltered from the wind, the gas may remain in effective concentration for from 20 to 30 minutes. As the cloud travels, it gradually becomes less concentrated and finally becomes too dilute to cause casualties. The distance downwind that a cloud is effective depends principally upon the amount of gas used per yard of front, and the width of the front on which the gas is released. Large-scale attacks are effective downwind for maximum distances of 5 or 6 miles. Nonpersistent chemical agents are comparatively ineffective in a wind of over 12 miles per hour.

(*The instructor signals for the smoke pots to be fired.*)

These smoke pots are used to demonstrate the travel of nonpersistent gas clouds. You will notice that the smoke moves with the wind. As it moves, it spreads at the rate of about 15% of the distance it travels, thinning out gradually as it moves along. A nonpersistent gas cloud acts almost exactly the same way. Of course, nonpersistent gas is almost invisible, and, since it is considerably heavier than smoke, it stays closer to the ground.

A nonpersistent gas cloud sounds no alarms as it travels. It envelops an area silently, and exposes the personnel thereon to its deadly effects almost instantly. Unless the troops who receive such an attack are very much on the alert, a nonpersistent gas cloud projected on them in the middle of the night will cause a great many casualties.

What are the requirements for protection against this form of attack? First of all, there must be an alarm system; gas sentries whose duty it will be to recognize the presence of gas and alert every member of the command before he has become dangerously exposed. In addition to the alarm system, every member of the command must have an efficient gas mask on his person. He must adjust the gas mask to his face promptly and properly, and he must wear his gas mask until the gas has dissipated from the area—and that is a relatively short period of time.

Irritant gas may also be projected in cloud attacks. The weapon most commonly used for this purpose is the irritant gas candle. When the candle is ignited, a bright, canary-yellow smoke is produced. This smoke drifts with the wind in much the same manner as a gas cloud from portable cylinders. A large cloud of irritant gas may be carried downwind in effective concentrations to maximum distances of 3 to 4 miles. The smoke is nonpersistent; hence it is dissipated from open areas in 10 minutes or less. The requirements for protection against this form of attack are the same as for nonpersistent gas clouds—a warning system and a good gas mask.

The term "shell attacks" is used to designate a type of gas attack where the gas is disseminated directly on the target area by means of mortar or artillery shells. Nonpersistent gas, persistent gas, and irritant gas can be disseminated in this manner.

For the projection of nonpersistent gas, it is necessary to use large caliber weapons in order to build up an effective concentration on the target area in a very short period of time. When time is available for their supply and installation, one of the most efficient weapons for the projection of

nonpersistent gas is the Livens projector. The Livens projector is a crude type of mortar. It has a range of about 1,450 yards. The shell, which weighs 60 pounds, holds about 30 pounds of nonpersistent gas. Livens projectors are fired in batteries of 25. They are usually installed in large numbers (20 or more batteries) to fire on large areas. The shells, which are provided with a 22-second time-fuze, explode shortly after they reach the ground and a cloud of high concentration blankets the area almost instantly. For example, the shells from one battery of 25 projectors concentrated on a single point will scatter over an area 320 yards in depth by 240 yards in width, and produce a gas cloud completely enveloping this area in less than 30 seconds. Thereafter, the gas cloud drifts with the wind just like any other gas cloud. This action can be demonstrated by bursting smoke containers. (*Instructor signals for tin cans filled with liquid smoke to be exploded.*) You will note that the smoke envelops the impact area quite rapidly, and that it soon begins to drift with the wind like a cloud gas attack. If you can picture in your minds several hundred or perhaps thousands of these containers exploding simultaneously on a large area, you can get a good idea of a shell attack with Livens projectors.

The requirements for protection against this form of attack are an alarm system to alert the command, a good gas mask for each individual in the affected area, and the wearing of the gas mask by all personnel until the gas has dissipated. If the gas sentries are well trained, they should be able to recognize the attack from the loud explosion produced by the firing of the Livens projector batteries, in which case there will be a period of about 30 seconds to alert the command before the gas begins to envelop the area. It should be remembered also that the gas cloud produced by a large-scale Livens projector attack will be effective downwind from the area in which the shells burst for several thousand yards and that personnel in these additional areas must take similar protective measures.

The action of nonpersistent gas attacks projected by large caliber mortars and artillery is quite similar to that of Livens projectors. The principal difference is the longer period of time during which shells fall on the target area. A Livens projector battery fires all of its shells simultaneously, one round per projector; but mortar and artillery gas shells usually are fired during a period of about two minutes. A well trained gas sentry may be able to recognize a gas attack projected by mortars and artillery by the muffled explosion of the shells. The requirements for protection are the same for mortar and artillery attacks as for Livens projector attacks.

Persistent gas may be placed in an area by means of chemical mortars, artillery, or airplane bombs. Both large and small caliber weapons may be used for this purpose. These attacks may be fired on areas occupied by personnel, or they may be fired on unoccupied areas to deny these areas to personnel through the threat of casualties. Since this type of gas will remain on the target area in effective concentration for several days, the firing may be executed over a period of several hours. It must be remembered that at normal temperatures the persistent gases are liquids. When a persistent gas shell bursts, a small amount of the chemical agent is thrown into the air as a vapor and this vapor drifts with the wind just like any other true gas. However, the greater part of the contents of the shell is deposited on the ground and vegetation, in liquid form, and will remain there, in effective concentration, for several days. During this time, vapor is constantly being given off from the liquid, and this vapor also drifts with the wind.

(*Instructor signals for the tin cans filled with simulated persistent gas to be blown up. The group is then moved closely downwind from the contaminated area so that each member can get the odor. The pattern of the liquid on the ground should also be inspected. The group is then moved to the simulated shell hole (See Figure 11) where instruction in substance as follows should be given.*)

This represents a shell hole of a 75-mm gas shell. When the shell bursts, the liquid agent is thrown over an area about 12 by 15 yards, extending principally from the point of burst in the direction of fire. A simulated persistent gas has been sprayed around this simulated shell hole to show you the pattern made by the liquid on the ground. The perimeter of the area of burst has been outlined on the ground so that you can see it better. The heaviest concentration is near the point of burst. A heavy concentration of liquid mustard resulting from the burst of a shell can be seen on the ground and vegetation, just the same as this simulated mustard can be seen. The pattern of a mortar shell, a 155-mm artillery shell, or a 30-lb. chemical bomb is quite similar to the pattern outlined here, except that the area is larger. For a 4.2-inch chemical mortar shell, the area of burst is about 40 yards in diameter; for a 155-mm artillery shell it is about 50 yards; and for a 30-lb. chemical bomb it is about 40 yards.

If you will imagine several thousand persistent gas shells being fired over a considerable period of time and quite evenly distributed over a large area, you can get a good idea of a chemical attack made with persistent gas shells. It is obvious that there are two danger areas: (1) The impact area where there is danger of contact with the liquid on the ground or on vegetation, and exposure to the vapor; and (2) an area downwind where there is danger of exposure to the vapor alone. The distance downwind that the vapor will be carried in effective concentration depends on the amount of gas used, the temperature, and the velocity of the wind. Under favorable conditions, it may be carried to a maximum distance of 600 or 800 yards.

For protection against this form of attack, a warning system is necessary. All personnel must be equipped with gas masks and protective clothing. These items must be adjusted promptly, and they must be worn continuously as long as the personnel remain on the area. If the tactical situation permits, the troops should be moved to previously selected, alternate positions, and contaminated equipment

decontaminated. If the tactical situation does not permit the occupation of alternate positions, the contaminated area should be held lightly and frequent reliefs provided. Personnel not required on the area should be sent to the rear where they can bathe, if practicable; rest without wearing protective equipment; and apply protective salve before going back into the contaminated area.

If the gas has been projected on certain areas or roads to prevent their use by our personnel, the problem of protection involves the location and definition of the contaminated areas, and the location of routes around or the decontamination of routes through the area. Even though a route through a contaminated area has been decontaminated, personnel using this route must wear gas masks and protective clothing.

Irritant gas, either of the nonpersistent type or the persistent type, may be projected by means of shells. When either type is used, the shells usually are fired intermittently on large areas over a period of several hours or even days. The problem of protection involves a warning system and the use of the gas mask throughout the period the agent is being fired, and so long as the agent remains on the target area. In case the attack extends over a long period of time, the question of sleeping and eating, without interference of the gas, may be difficult. It may require the construction and use of gas-proof shelters or the movement of personnel, by reliefs, to gas-free areas.

Persistent gas may also be projected by static dispersion. The term "static dispersion" is used to designate a method of disseminating liquid chemical agents by placing the container to be exploded directly on the area to be contaminated. This method of projecting chemical agents is applicable to defensive or retrograde action where the area to be contaminated is accessible to the defender's troops. In this case, land mines may be used to establish bands of persistent gas across avenues of approach or along the flanks of the defensive position. The chemical land mine is simply a tin can containing about a gallon of liquid mustard, and

provided with an explosive charge. Usually the mines are installed in four parallel lines 20-25 yards apart. The mines in each line are emplaced with an interval of about 10 yards. When the mines are exploded, the liquid gas (mustard or lewisite) is thrown in all directions. The result is a solid band of liquid gas, about 100 yards wide, for the entire length of the installation. When such bands are placed along stream lines or other places where vegetation is heavy, it is difficult for personnel to cross them without becoming contaminated with the liquid. Chemical land mines also may be used in much the same way along roads, on demolished bridges, and in defiles. One of these mines will be exploded so that you can see how it operates. (*The instructor signals for the mine to be exploded and then takes the class to the point of detonation to see the area of contamination.*)

In defensive or retrograde action, persistent gas may also be disseminated by means of hand-spraying devices or machine-spraying vehicles. Contaminated areas produced by these means are similar to those produced by chemical land mines.

The problem of protection against this form of attack involves the discovery and determination of the extent of the contaminated areas. If the tactical situation permits, it involves the location and use of alternate areas or routes. If the tactical situation does not so permit, it involves the decontamination of routes, or paths, through the gas barriers. Gas masks and protective clothing must be worn by all personnel passing through or closely downwind from the contaminated belt.

The term "air spray" is used to designate the method of disseminating liquid chemicals by means of tanks attached to airplanes. The airplane spray tank is a stream-lined tank which fits on the under side of the wing of the light bombardment plane. There is one tank on each wing. Each tank holds about 22 gallons of persistent gas. When the valve is opened, the liquid gas falls to the ground like rain.

(See Figure 13.) One plane, in flight, under average conditions of wind and weather, can cover with liquid gas an area about 1,000 yards long by 300 yards wide. This form of attack might be used against an infantry column far in rear of the front line. It may be used at night. If the pilot, by hedgehopping, comes over the column without being observed, and opens the valves permitting a chemical agent such as mustard to fall on the personnel below, it will be difficult for this personnel to secure adequate protection before the gas reaches the ground. First of all, there must be a warning system. A distant warning system is desirable, but it must be remembered that in most cases it will not be possible for a distant observer to determine whether the plane is equipped with spray tanks or bombs. In addition to the warning system, all personnel must be provided with gas masks and protective clothing. These items must be adjusted very promptly because the modern plane can fly the 1,000 yards to be sprayed, in less time than it takes to adjust a gas mask alone. After the attack is over, all personnel must get out of the contaminated belt by moving to windward. All persons contaminated with heavy drops of liquid agent must be given fresh clothing, and all equipment subjected to the heavy spray must be decontaminated as soon as practicable. All personnel must be kept out of the contaminated belt for at least 24 hours in summer and for 3 to 4 days in winter. Food and water that has become contaminated is unsafe for use, and must be destroyed.

FIFTH PERIOD

Care and Use of the Gas Mask:—60 minutes.

Equipment Required: 1 standard service gas mask, 1 diaphragm gas mask, 1 training mask for display purposes, 1 training gas mask per individual. A blackboard with a simple drawing of the gas mask canister as shown in Figure 4-FM 21-40 is desirable.

Instructional Hints: The fifth to eighth periods inclusive are devoted to the care and use of the gas mask

and to gas mask drill. The instruction should be conducted outdoors, by platoons. Following a short conference, covering the points enumerated below, the platoon should be formed for gas mask drill. Drills should be conducted slowly and BY THE NUMBERS.

All errors in the drill should be corrected promptly and carefully.

FIGURE 13.—Students of Chemical Warfare School, Edgewood Arsenal, Maryland, are caught by surprise as an airplane starts to spray them in simulated gas attack from the air.

When masks are first slung, all men should be instructed to loosen the harness straps, extending them to the tabs at the end.

When masks are first adjusted the instructor should observe the fit of each man and assist him in adjusting the straps, tightening them in the order: temple, chin, forehead.

When masks are first put in the carrier, the instructor checks each mask to see that it is placed in the carrier properly.

References: Paragraph 79, FM 21-40.

SUGGESTED CONFERENCE

Defense against chemical attack is divided into three phases: (1) First, there is individual protection which consists of those things that the individual may do to protect himself against gas. It is concerned principally with the care and use of the gas mask and protective clothing issued to the individual. (2) Second, there is collective protection which consists of those things that the platoon leader, the company commander, or higher commander may do to protect his command against gas. It is concerned principally with the establishment of warning systems for the protection of the command; the use of equipment to protect food, matériel and water against the effects of gas; the decontamination of weapons and other equipment which have become contaminated with persistent gas such as mustard; and in special situations the construction and use of gas-proof shelters. (3) Third, there is tactical protection which consists of the disposition of troops in combat so as to avoid or minimize gas casualties. This type of protection is concerned with the occupation of alternate positions when the primary positions have become contaminated with persistent gas; the use of alternate routes to avoid gas contaminated areas; and the occupation of positions or the use of routes least likely to be subjected to gas attacks.

The principal item of individual equipment is the gas mask. (*The instructor picks up the standard service gas mask.*) This is the standard service gas mask of the U. S. Army. The old style of this mask comes in five sizes, number one being the smallest. The present design of this mask is called a universal mask because the one size facepiece will fit almost all sizes and shapes of faces. A person with an extremely large face or one with an extremely small face will require one of the special size masks.

This is the standard diaphragm gas mask (*instructor picks up diaphragm mask*); it is exactly the same mask as the standard service gas mask, except that it is provided with a diaphragm which aids in the transmission of the voice. This mask is issued to officers, certain noncommissioned officers, telephone operators, and other personnel who are required to use the voice a great deal.

This is the training gas mask with which every soldier is equipped for training outside a theater of operation (*instructor picks up training gas mask*). The facepiece of this gas mask is of the universal type.

The standard service gas mask (*instructor picks it up again*) consists essentially of a canister, a hose, and a facepiece. When carried, but not in use, the gas mask is kept in a carrier slung on the left side of the body. The canister remains in the carrier when the mask is in use.

The hose and facepiece of the gas mask are made of rubber and covered with stockinet. The hose is corrugated to prevent kinking. The lower end of the hose is fastened to the elbow of the canister; the upper end is fastened to a metal piece called an angle tube. The eyepieces are made of safety glass. This is the head-harness and this is the head-harness pad. Inside the facepiece there is a rubber deflector which serves to bring the incoming air over the eyepieces, thus aiding in the prevention of dimming or fogging on the inside. Exhaled air goes out through the outlet valve. Inside the carrier there is a tube of antidim. This material is used to clean the eyepieces and to aid in preventing the collection of moisture thereon. (*The instructor demonstrates the use of the antidim set.*)

(*Refer to blackboard diagram of the gas mask canister. If the diagram is not prepared, use the actual canister to point out functioning.*) This diagram shows the construction of the gas mask canister, and roughly how it functions. The canister consists of three principal parts: The sheet-metal container; a filter for the removal of solid and liquid particles by mechanical filtration; and the chemical filling

for the removal of gases from the air. The chemical filling consists of a mixture of charcoal and soda-lime.

When an individual in a gas atmosphere inhales, a valve here in the bottom of the canister is opened and air enters the air space between the container and the filter. From here it goes through the filter where solid and liquid particles of gas, if present, are filtered out. The filter is the only part of the canister that will remove toxic smokes from the air breathed by the wearer. The air then passes to the interior of the canister where the toxic vapors, coming in contact with the charcoal, are absorbed by it. Some of the lighter gases are not held very firmly by the charcoal and are gradually released. As these gases are released, they are neutralized by the soda-lime mixture. The purified air then passes out of the canister at the top into the hose and thence to the facepiece and lungs of the wearer. Exhaled air leaves the facepiece through the outlet valve which is located in front of the mouth.

With this type of facepiece, the fit and adjustment are most important. In World War I, the service gas mask had a noseclip and a mouthpiece which forced the wearer to breathe through the canister; when the mouthpiece was in place and the noseclip was fastened to the nose there was no other way that the wearer could breathe. The wearer was absolutely ensured that he was breathing only purified air; but this mask was so very uncomfortable that the soldier frequently removed his mask and took a chance on the gas rather than continue to wear it. In the present gas mask, these objectionable features have been removed; but to get protection with the present standard gas mask it is necessary to have an exact fit and adjustment of the facepiece. If the wearer does not have a perfect seal around the edges of the facepiece, he does not get protection against gas.

The standard service gas mask, if properly worn, will protect the face and lungs of the wearer against every known war gas. It will not protect the body against the action of the vesicant or blistering type agents such as mustard. Protective clothing is required for that. The standard service

gas mask will not protect a person against carbon monoxide, nor ammonia fumes. These gases, however, are not suitable for use in warfare. The standard service gas mask does not provide oxygen. Therefore, it is of no value as a fireman's mask in places deficient in oxygen. It will not protect against concentrations of gas greater than one percent by volume of air. Concentrations greater than this will never be encountered in the field.

The gas mask is an expensive item of equipment, and it is an important item of equipment because it may be the means of saving a man's life. A soldier may be able to get in a shell hole, or behind a tree or some other defilade, and get some protection from bullets or high explosive, but when a gas attack comes over, there is only one thing that will protect his lungs, and that is a good gas mask. Its care is therefore very important.

The gas mask is made principally of rubber. Heat and moisture greatly accelerate the deterioration of rubber. Whenever the mask is placed in storage or is hung up in barracks, it should be put in a cool, dry place. It should not be placed in direct sunlight or next to stoves or steam radiators. Whenever the facepiece becomes damp from perspiration or rain, it should be dried out thoroughly before it is put away.

Whenever the gas mask is used in training, keep the headharness as loose as possible without losing the fit. The headharness does not have to be very tight; the principal thing in getting a fit is to get an even pull on all straps. If the straps are too tight, the rubber in the elastic will be stretched too much in putting on and taking off the mask, with the result that the rubber will break. When this happens, it is impossible to get a fit with the mask.

When the mask is put in the carrier, be sure that the facepiece and hose are in the proper position. If the facepiece is cramped or twisted, a permanent crease or wrinkle may be formed. This also makes it impossible to secure a fit. If the hose of the service gas mask is twisted, a permanent kink may result. This increases breathing resistance and may cause a leak in the hose. Whenever the gas mask is put away

for any appreciable length of time, put a faceform in the facepiece or, if this is not available, put a wad of newspapers in the facepiece, like this. *(Instructor demonstrates.)*

The gas mask is a fairly rugged item of equipment, but it can be ruined by being subjected to unnecessary roughness. If you sit down on your gas mask, you may break an eyepiece or crush the canister. If the eyepieces are broken, leaks may occur in them, and vision will be blurred. If the canister is crushed, it may permit gas-contaminated air to by-pass the chemicals in the canister. At any rate, the charcoal and chemicals in the canister will become pulverized, thus increasing the breathing resistance and decreasing the efficiency of the wearer.

(The instructor picks up a training gas mask.) The training gas mask differs only slightly from the standard service gas mask. It is provided with a small snout-type canister which is attached directly to the facepiece, thus eliminating the hose-tube. The eyepieces are made of plastic material instead of glass. The inlet valve is located in the bottom of the canister, the same as in the service mask. The outlet valve is on the front of the facepiece, just above the canister. The mask functions in the same general way as the service mask and gives the same protection against gas for a limited period of time. The life of the canister in concentrations of gas is short. It is not sufficiently long to make the training mask satisfactory for war use.

The training gas mask should be cared for in much the same manner as the standard service mask. When the mask is put away in barracks a wad of newspaper should always be placed in the facepiece; the mask should be in the carrier, and the carrier should be hung up by the strap. The eyepieces, being made of plastic, are easily scratched, causing blurred vision. This may be remedied by polishing with toothpaste and cloth.

SIXTH PERIOD

Review and Gas Mask Drill—30 minutes.

Equipment Required: 1 training mask per individual.

Instructional Hints: Review drills of previous period. Gradually increase the speed of the drills. In the adjustment of the mask WITHOUT THE NUMBERS, impress upon the men the importance of not breathing until the gas mask is completely adjusted to the face. Include as a new subject the inspection of the mask.

References: Paragraphs 79 and 80, FM 21-40.

SEVENTH PERIOD

Gas Mask Drill, and Use of the Gas Chamber—30 minutes.

Equipment Required: 1 training mask per individual; gas chamber; CN capsules, (Training allowance prescribed for each company by AR 775-10.)

Instructional Hints: Review gas mask drill and conclude the period by taking the platoon through the gas chamber. The purpose of the gas chamber is to test the fit of the gas mask in gas and to create confidence, on the part of the soldier, in his gas mask. Since neither of these purposes is served when a soldier goes into the gas chamber with his gas mask improperly adjusted, the instructor should carefully check the adjustment of the mask to each soldier's face before the platoon is taken into the gas chamber.

References: See paragraph 32 *a* (4) and note page 142, FM 21-40, for procedure in preparing the gas chamber and in conducting a class through it.

EIGHTH PERIOD

Repair and Disinfection of Gas Masks—30 minutes.

Equipment Required: Several gas masks which previous inspection has shown to be in need of repair or which are to be salvaged; 1 kit, gas mask repair, company; 1 kit, gas mask repair, regimental; formaldehyde; a supply of small rags; two or three pails and water.

Instructional Hints: The regimental gas mask repair kit should be obtained from the regimental gas officer. Pending

the receipt of TM 3-205, instructions as to the contents and use of tools and supplies contained in gas mask repair kits will be found in the pamphlet which is included in each regimental kit. Instruction should include a demonstration of repairs possible with the company kit, together with a display of tools and parts available in the regimental kit.

A demonstration of the proper method of disinfection of a gas mask should be followed by having each man disinfect his own mask.

References: Paragraph 34 *e* FM 21-40. Subparagraph (1) of this paragraph is changed as follows by Section II, Training Circular 13, W. D., 1941.

(1) Materials required.—(a) *For masks having glass eye lens.*—A 2 percent solution of cresol or lysol. A supply of small rags.

(b) *For masks having plastic eye lens.* A three percent solution of formaldehyde. A supply of small rags. Note: A three percent solution of formaldehyde is produced by adding one part of U. S. P. formalin (forty percent strength formaldehyde solution) to twelve parts of warm water. The formalin solution should be added slowly with stirring.

(2) Directions. * * *

(d) Formaldehyde in high concentration causes a smarting of the eyes and nose. Disinfection of masks when formaldehyde is used should be conducted outdoors if practicable, the operator standing on the upwind side of the formaldehyde solution container. When it is necessary to disinfect masks indoors, good ventilation must be assured; and when this is not possible, personnel involved should wear gas masks. In all cases, personnel carrying out disinfection with formaldehyde solution must wear rubber gloves. After the masks have been disinfected as directed in paragraph (a) above, they should be exposed to free circulation of air at least 12 hours in order to allow evaporation of the formaldehyde solution from the rubber.

(A. G. 062.11) (2-19-41.)

NINTH PERIOD

Other Individual Protective Equipment—30 minutes.

Equipment Required:—One suit of permeable and one suit of impermeable protective clothing. If these are not available, use an alligator raincoat to represent the impermeable type of protective clothing and a one-piece fatigue uniform to represent the permeable type. A training gas mask per individual.

Instructional Hints:—See notes included in suggested scope which follows. Following the conference and demonstration of protective equipment the remainder of the period may be devoted to playing some group game wearing the training mask.

References: Paragraph 21, FM 21-40.

SUGGESTED CONFERENCE

The basic item of equipment for protection against gas is the gas mask. There are, however, two other items of individual equipment that should be given special consideration —protective clothing and protective salve.

Although the gas mask will protect the face and lungs of the wearer against every known war gas, it will not protect the body against the blistering action of the persistent gases like mustard or lewisite. To give protection to the body, a protective clothing is required.

There are two types of protective clothing—the impermeable type and the permeable type. *(If protective clothing is available, a soldier wearing the impermeable type comes before the class. If not, the soldier wears an alligator raincoat to represent it.)* This is the impermeable type. The suit consists of shoes that are impermeable to gas, one-piece coveralls made of a material that is impermeable to gas, and impermeable gloves. The coveralls are provided with a hood which fits around the gas mask, giving protection to the back of the head and to the neck of the wearer. This suit is exactly what the term indicates. It is impermeable to mustard or lewisite. These agents will not go through it. It is

also impermeable to air, and therefore, is very uncomfortable to wear for any appreciable length of time. About an hour is as long as a person can wear it without excessive discomfort. This is especially true in summer. Since this clothing gives complete protection against the persistent agents, it is used wherever it is necessary for personnel to come in contact with large quantities of these agents.

(Soldier wearing the permeable type of protective clothing, or, if this is not available, a suit of coveralls, comes before the class.) This is the permeable type of protective clothing. With the exception of the hood, this clothing consists of ordinary articles of clothing which have been specially treated with chemicals that will neutralize small quantities of persistent gas such as mustard or lewisite. The suit consists of shoes specially treated to render them impermeable to persistent gas, specially treated coveralls with hood attached, specially treated gloves, and specially treated underwear. This type of protective clothing is not particularly uncomfortable to wear, when the hood and gloves are not adjusted, it is just about as comfortable to wear as the regular issue clothing, but it does not give as complete protection against gas as the impermeable type. In a theater of operation where use of persistent agents is probable the permeable type of clothing should be issued to and worn continuously by all personnel likely to come in contact with persistent gas either in liquid or vapor form. The hood and gloves need not be adjusted until the presence of persistent gas is recognized or contact with it becomes imminent. They should be kept adjusted as long as the wearer remains in the contaminated area.

The action of mustard gas is most severe under the arms, around the crotch, and on other moist places of the body. In some foreign armies, a protective salve is issued to the troops for use in protecting these parts of the body. A salve of this type may be issued to individuals in the U. S. Army. If so, before going into an area where he is likely to come in contact with persistent gas, each man should spread this salve freely on all parts of the body that are particularly susceptible to these agents.

FIGURE 14.—IMPERMEABLE PROTECTIVE CLOTHING
(1) Coverall, (2) Hood, (3) Adjusting strap for coverall, (4) Adjusting strap for hood, (5) Service mask, (6) Glove, (7) Adjusting strap for glove, (8) Zipper, (9) Belt, not visible, (10) Adjusting strap for coverall pants bottom, (11) Shoes.

ADDITIONAL TRAINING

Wearing the Gas Mask During Other Training.

Equipment Required: 1 training mask per individual.

Instructional Hints: Wearing the gas mask for long periods of time results in a very noticeable reduction in an individual's efficiency. The amount of this loss in efficiency varies somewhat with the type of duty being performed. If performing heavy work, it may be as much as fifty percent. However, this loss in efficiency can be minimized by practice. If such practice is not given, there may be more involved than the mere loss of efficiency caused by wearing gas masks. A surprise gas attack may result in such confusion in the affected unit that all combat operations will have to be suspended until the gas attack is over. Every combat unit should be so trained in wearing the gas mask in combat operations that when a surprise gas attack comes over, all personnel will promptly adjust their gas masks and continue their normal operations with the minimum loss of efficiency. This objective can be attained only by a progressive and continued program of training. The members of every combat unit must be trained to perform any and all of their combat duties while wearing the gas mask. This training should be made easy at first and then progressively more difficult in subsequent days, varying from day to day the type of duty performed. It may be adapted to marching, extended order movements, marching by compass, the installation and firing of weapons, digging intrenchments, and various types of day and night maneuvers. In some of the maneuvers actual tear gas should be introduced during an important phase of the action in order to observe the reaction of the unit to a gas attack. Each unit of infantry has an annual allowance of tear gas grenades which may be used for this purpose. (See AR 775-10.)

TENTH PERIOD

The Use of Collective Protective Equipment—60 minutes.

Equipment Required: A litter; gas alarm devices; 10 pounds of hydrated lime; a bottle of soapy water to simulate

a noncorrosive decontaminating agent; apparatus, decontaminating, 1½-quart capacity filled with soapy water; a small tarpaulin; 1 gallon of simulated mustard or crankcase drainings; galvanized iron can, 20-gallon; galvanized iron bucket, 10 quart; small bottle of gasoline or kerosene; rags; suit of clothing.

Instructional Hints: See notes included under the suggested scope. Gas noncommissioned officers or other enlisted men should be selected and rehearsed to give the demonstrations.

References Paragraphs 24 to 27, inclusive, FM 21-40. Paragraph 24 as changed by TC 53, W. D. 1941 reads as follows:

1. The use of sirens, whistles, vehicular horns, or klaxons for gas alarm purposes is prohibited.

2. Pending the development of a distinctive gas alarm, the following signals only will be used as local alarms to warn of the presence of gas:

Percussion sounds, such as those produced by bells, triangles, iron rails, and empty cartridge cases, struck rapidly and continuously.

3. In connection with instructions contained in paragraph 3*b*, Section II, Training Circular No. 35, War Department, 1941, care will be taken by local commanders to avoid confusing *gas alarms* with simulated battle sounds.

SUGGESTED CONFERENCE

Collective protection is concerned with the utilization of measures and equipment for the protection of groups of individuals against gas. The principal items of equipment used are: Gas alarms; materials and equipment for destroying persistent gas; gas-proof covers; and gas-proof shelters.

Closely connected with the use of gas alarms are the duties of gas sentries. It is apparent that we must have an efficient gas alarm system in order to alert all members of

the command in sufficient time for them to put on gas masks and adjust protective clothing before being subjected to heavy concentrations of gas. This is especially true at night when men are sleeping. They can become dangerously exposed before being awakened by the effects of the gas. It is also true, both day and night, when attacked by airplane spray, because in such an attack the time for adjustment of protective equipment is limited, at best.

Gas sentries are equipped with gas alarms. The gas alarm must be distinctive in order that it will not be confused with antiaircraft or antitank alarms. No alarm device has been standardized. Bells, triangles, pieces of steel rails, brass shell cases or other similar devices that may be used to produce percussion sounds will be struck rapidly and continuously to warn a command in case of a gas attack. (*The instructor demonstrates use of improvised alarms.)*

The gas sentry should usually be posted upwind from the unit he is designated to warn, so that he will be the first to smell a gas cloud coming from upwind areas. If the unit is sleeping, the gas sentry must know where every member is located. The sentry is provided with a gas alarm. He remains on the alert for a gas attack or for any sounds indicating the imminence of a gas attack. In case he smells gas, or sees it during daylight, he yells, "Gas," puts on his gas mask, sounds the gas alarm, adjusts his protective clothing if necessary, and then checks to see that every member of the unit is alerted and taking proper protective measures. He may also be required to place protective covers over supplies or equipment liable to contamination by the gas. If he detects sounds indicating enemy preparations for a gas attack, or hears a gas alarm in some other area, he does not sound the alarm, but awakens the platoon leader and gives him the information obtained.

Equipment that becomes contaminated with persistent gas is dangerous to use until it has been decontaminated. The decontaminating measures should be undertaken as early as possible after contamination. It may also be necessary in many situations to decontaminate small areas of ground or demolitions that have been contaminated with

persistent gas. There are two principal types of materials that are used for this purpose (1) chloride of lime, and (2) noncorrosive decontaminating agent.

Chloride of lime is a good decontaminating agent. It is cheap, and can be provided in large quantities. However, it is corrosive to metals and should not be used on the working parts of weapons or on instruments. Chloride of lime can be used in two ways: (1) In water solution, or (2) mixed with earth. We will demonstrate these methods.

(An enlisted assistant demonstrates the preparation and use of chloride of lime in solution as the instructor talks.) To use chloride of lime in solution, the dry lime is placed in a bucket or other suitable container and enough water is added to make a solution the consistency of thick cream. The solution is stirred with a stick until it becomes well mixed. Using a swab made with a rag and a stick, this solution is thoroughly smeared over the contaminated item. *(The assistant should smear the solution over a pick or some other item that will not be damaged by corrosion.)* The solution is allowed to remain on the contaminated item for at least an hour. It is then washed off and any metal parts that might be damaged by corrosion are oiled. This method of decontamination is applicable to the vertical walls of buildings, to miscellaneous demolitions, and to certain types of rough equipment. Chloride of lime solution may also be used to decontaminate the chassis and bodies of vehicles. In this case, the chloride of lime is more conveniently applied by means of a pressure spray, using a solution thin enough to prevent clogging of the spray nozzle. *(This method of decontamination is demonstrated, using a garden pressure spray and some type of vehicle that will not be damaged by the hydrated lime.)*

In the decontamination of shell holes and small areas of ground, chloride of lime can be used more effectively in its original, dry state. Since chloride of lime and liquid mustard react violently when they come in contact and a heavy concentration of mustard vapor is produced by this reaction, the lime should be mixed with earth at the ratio of one part of lime to three parts of earth. (*The assistant demonstrates*

this procedure and decontaminates the shell hole as the instructor talks.) This mixture is spread thoroughly over the ground to be decontaminated, and is then spaded into the ground so that complete contact will be obtained between the mustard and the lime-mixture. For heavily contaminated areas, it takes about one pound of chloride of lime to each square yard of surface.

The noncorrosive decontaminating agent is used to decontaminate items of equipment that might be damaged by corrosion. This agent is milky in appearance, similar to this material. (*A bottle of soapy water should be shown to the class.*) Let us take, for example, a rifle that has become contaminated with mustard. By applying this noncorrosive decontaminating agent to the rifle, the mustard is destroyed in just a few minutes. The rifle is then cleaned and oiled. After this procedure, the rifle may be used again with safety. (*As the instructor talks, an assistant should decontaminate the rifle, using the small, spray tank filled with soapy water for this purpose.*)

Protective covers are used to protect food, water, and equipment from the effects of persistent gas. They are made of materials that are resistant to mustard or similar gases. They are somewhat similar in appearance to a tarpaulin such as I have here. (*The instructor shows the tarpaulin and demonstrates how it is placed over equipment to protect it from persistent gas.*)

Clothing contaminated with persistent gas must be discarded or decontaminated as soon as possible. If practicable, it should be discarded and new clothing issued; but in battle such procedure usually will not be practicable. Some action must be taken almost immediately, otherwise the wearer will suffer serious burns as a result of continued contact with the contaminated clothing. When necessary to decontaminate clothing in or near the front lines, this may be accomplished either by sponging the contaminated parts with the noncorrosive decontaminating agent or by steaming in an improvised kettle. (*An assistant should demonstrate the decontamination of clothing by sponging with soapy water, used to simulate the noncorrosive decontaminating agent.*)

Since the noncorrosive decontaminating agent is irritating to the skin, clothing that is heavily saturated with this agent should not be permitted to come into close contact with the skin.

In the steaming process, an ordinary galvanized iron can of about 20-gallon capacity may be used. About two gallons of water are used and a false bottom of brush or other material is placed in the bottom of the can to keep the clothing above the water. The contaminated clothing is then placed in the can and a fire built under it. After the clothing has been steamed for about four hours, it can be worn with a reasonable degree of safety. (*This procedure may be demonstrated using the 20-gallon can and a suit of fatigue clothing.*)

Every soldier should know something about the first-aid measures that can be applied by infantry personnel to gas casualties in the field. The nonpersistent gases like phosgene act directly upon the lungs, irritating them and causing the lung cells to fill up with fluid from the body. This cuts down the supply of oxygen to the blood. Therefore, it is necessary that any person who is affected by nonpersistent gas be required to conserve his oxygen and to engage in no activity that will increase the amount of oxygen required by the body. Since any activity involving movement greatly increases the amount of oxygen required, a nonpersistent gas casualty should not be permitted to walk, or perform any other type of movement, even though he may insist that he is able to do so. He should be required to lie down. His clothing should be loosened. He should be kept warm. He should be given a stimulant, if available, and he should be taken to an aid station by litter or motor transportation. (*An enlisted man simulates nonpersistent gas poisoning. Two other enlisted men then demonstrate the proper first-aid measures as stated above.*)

In the case of a mustard gas casualty, the casualty is removed to a "clear area", where his contaminated clothing is removed. Portions of the body that are contaminated with the liquid agent should be cleansed with kerosene, gasoline, or soap and hot water. The eyes should be cleansed with a

solution of baking soda or boric acid solution. After the cleansing procedure, the affected parts of the body should be covered with protective ointment. To be of much value, these measures must be taken within 15 minutes after exposure. If the patient has breathed strong concentrations of mustard gas vapor, he should be treated as a litter patient, the same as a nonpersistent gas casualty. Otherwise, he may be permitted to walk to the aid station. (*An enlisted man simulates persistent gas contamination and two men demonstrate the proper first-aid measures as indicated above.*)

A casualty resulting from contact with solid particles of white phosphorous should be sent to the aid station for treatment as quickly as possible. In some cases, large particles of the white phosphorous may imbed themselves in the flesh and burn for a period of several minutes. In cases of this kind, mud should be applied to the affected parts as quickly as possible. By thus excluding the air from the white phosphorous, the burning will be temporarily stopped. At the aid station, the surgeon can use certain chemical substances to prevent a renewal of the burning while the particle is being removed. (*The method of preparing and applying mud to an affected part may be demonstrated, using a canteen of water.*)

ELEVENTH PERIOD

Protective Measures Before, During, and After a Nonpersistent Gas Attack—30 minutes.

Equipment Required:—An 81-mm mortar platoon with combat equipment; a gas alarm; oil and rags; four cans filled with liquid smoke; detonating equipment.

Instructional Hints:—Initial instruction in this subject should be in the nature of a demonstration. Subsequent instruction should consist of practical work by the platoon. The demonstration outlined below involves the use of an 81-mm mortar platoon; however, exercises of a similar nature may be arranged for rifle or machine-gun platoons.

The platoon, together with the members of the medical detachment who are to participate in the demonstration,

should rehearse the exercise at least once. In order to assist those who have speaking parts in the demonstration, their lines may be furnished them typed on three by five inch cards. This demonstration should be given for battalion groups.

OUTLINE OF DEMONSTRATION

(*The 81-mm mortar platoon with complete equipment advances in extended formation to a point in front of the class, where the platoon leader gives the command, "Action," and mortars are installed for firing.*)

The instructor explains the demonstration as follows:—

This 81-mm mortar platoon is going through an exercise to demonstrate a few of the things that the commander and the members of the platoon must do before, during, and after a gas attack. Let us assume that this 81-mm mortar platoon is in position in the front lines and that gas is being used by the enemy at every opportunity. It is night and the members of the platoon are trying to get some sleep prior to an attack at daylight. (*The members of the platoon lie down near their weapons.*) The platoon leader, knowing that the enemy has been using gas at every opportunity and that weather conditions are favorable for the enemy's use of gas, posts a gas sentry. *(The platoon leader posts a gas sentry.)* You will notice that the gas sentry is equipped with a gas alarm and that he is being posted upwind from the platoon. The platoon leader is giving the sentry his instructions which should be somewhat as follows: "Private Blank, conditions look very favorable for an enemy gas attack tonight. You will be the gas sentry from now until midnight when you will awaken Private Jones, who will relieve you. I want you to keep very much on the alert for a gas attack. If you smell gas or recognize the sound of gas shells falling on this area, give the alarm at once. Then go around and see that every member of the platoon is awakened and adjusting his protective equipment. Do you know where every member of the platoon is located? If you don't, find out right away. If you hear anything that sounds like enemy preparations for a gas attack or hear a gas alarm in some

other area, don't sound the alarm, but come and awaken me. I am now going to give Private Jones his instructions and then I will lie down over there by that tree. Do you understand your instructions?" (*The platoon leader moves over to another private and gives him the necessary instructions and then lies down to sleep. The gas sentry sits down, but remains on the alert.*

The instructor signals an assistant to explode the tin cans filled with smoke to represent a nonpersistent gas attack. The smoke drifts over the gas sentry and the sleeping platoon. The sentry yells, "Gas," puts on his gas mask, and sounds the gas alarm, moving among the members of the platoon and checking to see that all are awake and putting on gas masks.

The platoon leader puts on his gas mask promptly and checks to see that proper gas discipline is being maintained in the platoon. He tests from time to time to determine when the air is free of gas. When the smoke has dissipated from the area, he orders gas masks removed. He then checks up to find out whether there are any gas casualties.

There is one gas casualty. The platoon leader directs the squad leader to take proper first-aid measures and sends a messenger to secure a medical aid man and litter bearers. This having been taken care of, the platoon leader directs that the working parts of weapons be cleaned and oiled.)

During these operations, the instructor explains the action to the class as follows:

Let us assume that there is a gas attack. The smoke cloud that you see drifting toward the platoon represents a nonpersistent gas attack projected on this position by means of mortar or Livens projector shell. Let us assume that the gas sentry got a whiff of the gas before he got his gas mask on and recognized it as a nonpersistent gas—phosgene. Let us see what happens in this platoon. The sentry yells, "Gas," and puts on his gas mask. He sounds the alarm and then checks up to see that all members of the platoon are alerted and putting on gas masks.

What does the platoon leader do? He is responsible for the gas discipline of his platoon. He is checking up to see that every member of the platoon is alerted and putting on a gas mask. He also checks to see that the members of the platoon are keeping their gas masks on until he gives orders for them to be removed. The platoon leader knows that if the members of his platoon put on their gas masks promptly, and keep them on until the gas has dissipated from the area, there will be no gas casualties. You will notice that the platoon leader is testing for gas from time to time. He is trying to determine when it is safe to remove gas masks. Since this is a nonpersistent gas attack, the gas will be dissipated from the area in less than 10 minutes. The platoon leader finds that the air is free of gas and he orders gas masks removed.

You probably observed the fact that one member of the platoon was slow in getting his gas mask adjusted and that he is now quite seriously affected by the gas breathed during this period of delay. (*The patient coughs and strangles loudly.*) The platoon leader has observed the condition of this man and is directing first-aid measures. He requires the man to lie down and he directs the squad leader to loosen the man's clothing. The platoon leader is sending a runner to get an aid man and litter bearers. (*Aid man arrives and gives a stimulant.*) Here is the aid man who is giving the patient a stimulant. (*Litter bearers arrive and carry the patient to the aid station.*) Here are the litter bearers; they are taking the patient to the rear. A nonpersistent gas patient should not be allowed to walk, even though he may insist that he is able to do so.

Now that all casualties have been taken care of, the platoon leader turns his attention to the care of equipment. He directs the squad leaders to have the working parts of all weapons cleaned and oiled. He directs similar action for all ammunition in the hands of members of the platoon. This action is necessary to prevent corrosion.

These things having been done, the platoon can go back to sleep. The gas sentry must remain on duty, because the enemy might see fit to subject the platoon to another gas attack.

TWELFTH PERIOD

Protective Measures Before, During, and After a Persistent Gas Attack—60 minutes.

Materials Required:—Complete equipment for a mortar platoon; gas alarm; two pairs of rubber boots; two raincoats to simulate impermeable protective clothing; chloride of lime; noncorrosive decontaminating agent (simulated) in pressure spray apparatus; bottle of gasoline; tube of shaving cream to represent protective salve; large paper bag; rags; two shovels; one push cart to represent a weapon carrier; 4 tin cans filled with simulated persistent gas; detonating equipment. Each member of the platoon is dressed in fatigue clothes to represent protective clothing of the permeable type.

Instructional Hints:—Same as for eleventh period.

OUTLINE OF DEMONSTRATION

(The instructor orients the class in a manner similar to that indicated for the eleventh period.

A gas sentry, and the members of the platoon are lying down simulating rest or sleep.

The instructor signals an assistant who explodes the tin cans filled with simulated persistent gas. The sentry yells, "Gas. Persistent gas," puts on his gas mask, sounds the gas alarm, adjusts his protective clothing, and then moves rapidly among the members of the platoon, continuing to sound the alarm and checking to see that all members of the platoon are awake and taking proper protective measures.

The platoon leader having put on his gas mask and adjusted protective clothing, checks on the gas discipline of the platoon and the effects of the gas on personnel and equipment. He finds two members of one squad and the mortar heavily contaminated with liquid mustard. With the exception of this squad, he directs the platoon to occupy an alternate position without delay.

The platoon leader sends a messenger to the rear for decontaminating equipment and materials for the decontamination of the mortar. He sends a message to the company commander informing him of the situation and requests that a decontaminating detail be sent to the area.

The leader of the affected squad moves his squad upwind from the area and assists the affected members in removing contaminated clothing which is thrown to one side. Assisted by an aid man, he gives appropriate first-aid to the members of his squad.

The messenger arrives with the noncorrosive decontaminating apparatus, and under the supervision of the platoon leader, decontaminates the 81-mm mortar.

A company gas noncommissioned officer arrives with fresh clothing and a decontaminating detail of two men dressed in impermeable protective clothing. The two affected members of the mortar squad put on the fresh clothing, and the squad takes its equipment and moves to the alternate position prescribed for the platoon.

The two men of the decontaminating detail are equipped with decontaminating equipment and materials of both types, chloride of lime and noncorrosive decontaminating agent. Under the supervision of the gas noncommissioned officer, they decontaminate a shell hole assumed to be in front of a concrete pillbox that must be occupied by a machine-gun crew. They then demonstrate the decontamination of a weapon carrier, using the push cart to represent the carrier.

The gas noncommissioned officer posts the contaminated area with signs reading "PERSISTENT GAS" and showing the date of contamination.

As the detail prepares to leave the area, the contaminated clothing discarded by the two members of the mortar squad is placed in a paper bag and taken to the rear.)

During the action indicated above the instructor explains the demonstration as follows:

The demonstration which is to begin in a few minutes is designed to show the action of certain personnel of a platoon before, during, and after a persistent gas attack. The

tactical situation that we have assumed for this demonstration is similiar to that of our last demonstration.

An 81-mm mortar platoon occupies a defensive position in a forward battalion area. It is night, and the men are trying to get some rest prior to a hostile attack which is expected at daybreak. A gas sentry is posted. Every member of the platoon has a gas mask, a tube of protective ointment, and is wearing the permeable type of protective clothing which is represented by coveralls.

There is a gas attack, but this time you will notice that it is a different type of gas. The gas sentry gets a whiff of the vapor and recognizes it as persistent gas—mustard. Let us see what he does in this situation. He yells, "Gas. Persistent gas," puts on his gas mask, sounds his gas alarm briefly and adjusts his protective clothing, fastening the hood around his gas mask and putting on protective gloves. After his clothing is adjusted, he moves rapidly among the members of the platoon to see that each man is awake and adjusting his gas mask and protective clothing.

You will see also that the platoon leader has adjusted his protective equipment and is now moving among the members of the platoon to check the gas discipline and to find out what effects the gas is having on his platoon and its equipment.

The gas attack is now over and the platoon leader finds that the area is so heavily contaminated with persistent gas that it will be necessary to move the platoon to one of the previously selected alternate positions. He finds that a mustard-gas shell landed near one of his mortar squads, contaminating the mortar and two members of the squad with large quantities of liquid mustard. He orders the squad to move upwind from the contaminated area and the squad leader to take the necessary first-aid measures for the protection of the two contaminated men. Some of the weapon carriers of the company have come forward to deliver an additional supply of ammunition. Each motor vehicle is equipped with a 1½-quart, noncorrosive decontaminating apparatus. He sends one of the members of the squad to one

of the weapon carriers to get the noncorrosive decontaminating apparatus with which to decontaminate the mortar.

The platoon leader also sends a message to the company commander informing him of the situation and the action being taken, and requests that a decontaminating detail be sent to assist him in the necessary decontaminating operations.

The squad leader finds that the clothing of the two members of his squad, caught in the burst of the mustard-gas shell, is very heavily contaminated with liquid mustard. He assists these men in removing their clothing and when it is removed throws it to one side. He also finds that the arms and hands of the two men are contaminated with liquid mustard.

Here is an aid man. Someone must have told him of the situation in this platoon, or perhaps he was just expecting mustard-gas casualties because he has gasoline and rags with him. The squad leader and the aid man are removing the mustard from the men's arms, using the gasoline and rags. The rags used will have to be buried or thrown where no other person will come in contact with them. Having removed all the mustard that they can from the men's arms, the corporal and aid man apply protective ointment to the affected parts.

Here is the man who went to the truck for the decontaminating apparatus. He is reporting to the platoon leader that one of the weapon carriers has been heavily contaminated with liquid mustard. He is now using the decontaminating apparatus to decontaminate the mortar. You will notice that he is wearing his gas mask and protective clothing and that he is careful not to contaminate himself when moving around the mortar. This material that he is using will neutralize mustard almost instantly and it will not corrode weapons or other metal equipment.

The company gas noncommissioned officer is now arriving with a decontaminating detail, and he has some fresh clothing with him. The source of the members of this detail will depend upon the situation and the policy of the battalion to which the platoon belongs. If the use of persistent

gas has been frequent, it is possible that each company will have organized and trained a decontaminating detail which will be held, together with materials and equipment, near the company command post. Members of the battalion ammunition and pioneer platoon may also be trained and used for this job. In some situations, the reserve rifle company may be required by the battalion commander to provide decontaminating details. The company apparently has a good supply sergeant; he has fresh clothing available. The gas noncommissioned officer brought two suits with him for the men who have been contaminated. They are now putting on these suits. The mortar having been decontaminated, the squad takes its equipment and moves to the alternate position.

Now, let us suppose that one of these mustard-gas shells landed closely in front and upwind of a position that a machine-gun crew must continue to occupy. To remove the danger of these men becoming casualties from contact with the vapor being given off, the shell hole must be decontaminated. Chloride of lime mixed with earth is satisfactory for this purpose. The decontaminating detail will do this work. The detail is wearing the impermeable type of protective clothing completely adjusted. The chloride of lime is mixed with earth at the ratio of one part of chloride of lime to three parts of earth. This mixture is spread thoroughly over the area of burst and is spaded into the loose ground of the shell crater.

Let us assume that we are now back at the location where one of the weapon carriers of the platoon was heavily contaminated with liquid mustard. It will be dangerous to use this truck for several days unless it is decontaminated. It can be decontaminated with chloride of lime solution, applying it either with swabs or with pressure spray. Using this hand cart to represent the truck, the decontaminating detail, which we assume to be wearing the impermeable type of protective clothing, is now demonstrating how this is done. Using swabs, the detail is applying the solution to all parts of the vehicle. It is a slow and difficult procedure. After this solution is

applied, it should be allowed to remain on the vehicle for at least an hour.

You will recall that the leader of the squad that was affected by the mustard gas shell removed the contaminated clothing of two men and threw it away, and that fresh clothing was supplied these men. It may not always be possible to supply new clothing to men in or near the front lines. It may be necessary in some cases to decontaminate the clothing in the front lines by improvised methods, sponging with neutralizing chemicals or steaming, as was demonstrated in a previous exercise. When fresh clothing can be provided, as was done in the exercise today, the decontaminating detail should place the contaminated clothing in some kind of gas-proof container and take it to the rear for decontamination. The gas noncommissioned officer is placing the contaminated clothing in paper bags used to represent gas-proof containers. When he goes to the rear with his detail, he will take this clothing with him.

The area of the platoon will be dangerous for troops to occupy or pass through for several days. Warning signs should therefore be posted around the area so that other troops will be informed of the danger of contamination. These signs should give the type of agent and the date of contamination. The gas noncommissioned officer is putting up signs around the area involved in this simulated gas attack.

The detail now secures its equipment and the contaminated clothing, and moves to the rear.

TACTICAL PROTECTION

The training of troops in tactical protection is very largely unit training. This phase of the instruction can best be conducted by introducing chemical situations into tactical exercises of various types. Exercises of the following types are suggested: (See Figure 15.)

Exercise 1—Assume that a battalion of infantry is in bivouac in Woods "A," a low wooded area surrounded by high hills. Tear-gas grenades are ignited in various parts of

the woods to simulate a nonpersistent gas attack. Since the gas will remain in such an area for a long period of time, personnel of the battalion are subjected to the discomfort of wearing gas masks for a long period. The battalion is moved to area "B," a fairly open area on rolling terrain, with low brush and scattered trees offering concealment from the air. The exercise is repeated. In this case the gas will remain on the area for less than ten minutes. The desirability is thus demonstrated of selecting bivouac areas that will be least affected by gas, when other tactical considerations permit.

Exercise 2.—An infantry battalion has been directed to march from "C" to "D." Simulated mustard gas is placed on area "E" to represent the interdiction, by the enemy, of a route of approach with a persistent gas. When the advance guard discovers the contaminated area, the battalion is halted while the gas officer and gas noncommissioned officer reconnoiter the extent of the affected area and select an alternate route for the battalion upwind from this area.

Exercise 3.—The battalion is occupying a defensive position on Hill "G." The position is shelled (simulated with flags) with persistent gas, making it desirable for the battalion to occupy an alternate position "H" which will meet the requirements of the tactical situation. Approval having been obtained from higher headquarters, the occupation of the alternate position is accomplished.

Exercise 4.—In a situation similar to 3 above, the tactical situation will not permit the evacuation of the position and the occupation of an alternate position. A plan is prepared and executed for the frequent relief of personnel in the contaminated area and for sending the personnel relieved to rear areas for such preventive and first-aid treatments as may be practical.

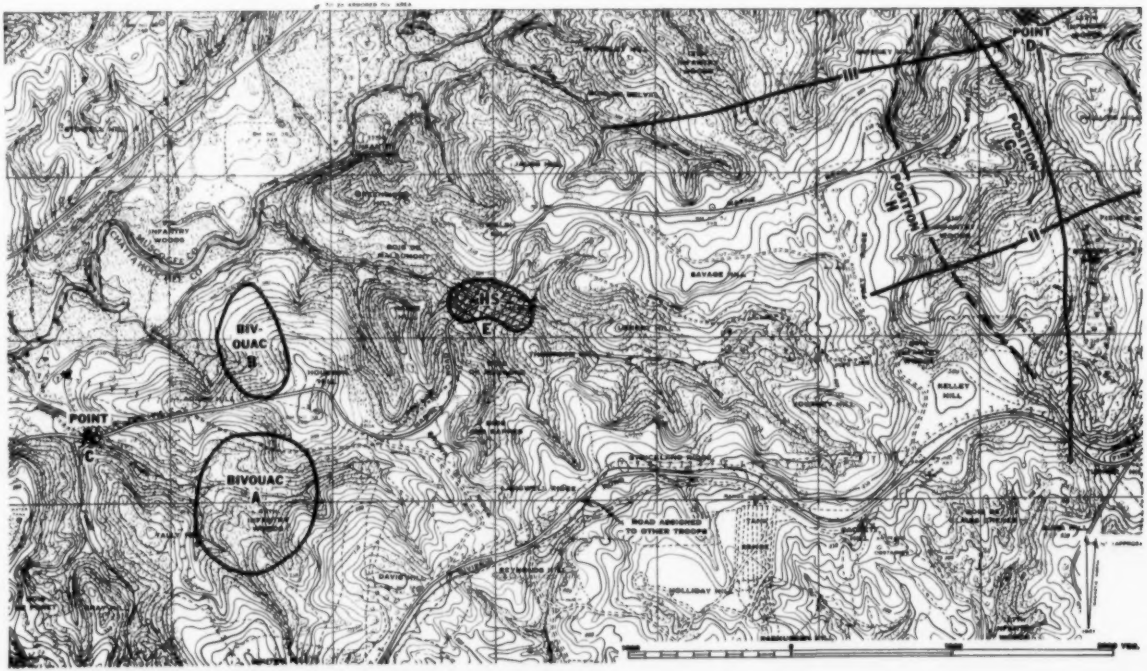

POINT D
POSITION G
POSITION H
BIV-OUAC B
HS E
POINT C
BIVOUAC A
ROAD ASSIGNED TO OTHER TROOPS
KELLEY HILL
DAVIS HILL
HOLLIDAY HILL

FIGURE 15.

CHAPTER 3

Training Aids

In time of war the training of military personnel must be carried on with the utmost speed and efficiency. Little time can be devoted to wordy explanations and step-by-step descriptions.

ONE PICTURE IS WORTH TEN THOUSAND WORDS

According to psychologists, 80 per cent of our impressions are received visually. Such instruction focuses the attention, and leaves lasting impressions, thus speeding up the learning process. We have only to look at our pictorial magazines, papers, and billboards to see to what extent this factor has been used by commercial advertisers to inform the public of their product.

Most military subjects lend themselves to visual instruction or to the employment of training aids which appeal to the eye. These aids should be simple, easy to prepare or procure, and readily understood.

The illustrations which follow show a few training aids which have been developed. They have been selected because of their simplicity and adaptability to various types of instruction.

THE BLACKBOARD

The blackboard is one of the earliest and most universally used of all aids to instruction; yet it has many desirable features otherwise available only in the most elaborate of aids.

One of these features is the element of suspense. As the class watches the instructor draw his sketch on the board, step by step, curiosity as to what comes next runs high.

Coincident with this is concentration on the element under immediate consideration. For example, if the instructor is drawing a diagram of a piece of machinery, describing its operation as he draws, the students cannot even try to anticipate, nor is attention distracted by an unexplained gear, since that gear will not be drawn until the proper moment.

Crude drawings or sketches are acceptable in blackboard work. However, if the instructor has little or no freehand ability, or if an accurate drawing is desired, the sketch may be made prior to class time, then erased, so a faint outline is visible only to the instructor. This method is very impressive, since the drawing can be made rapidly and accurately, without erasures or corrections.

Light striking the board from certain angles may make chalk lines invisible to some portions of the class. It is important, therefore, that the blackboard be so situated, or the windows so shaded, that there is no reflection from the board to any of the students.

The instructor should stand away from his drawing when discussion is in progress. As soon as all discussion of the subject is finished, the picture should be erased, or the blackboard put out of sight, to avoid distraction.

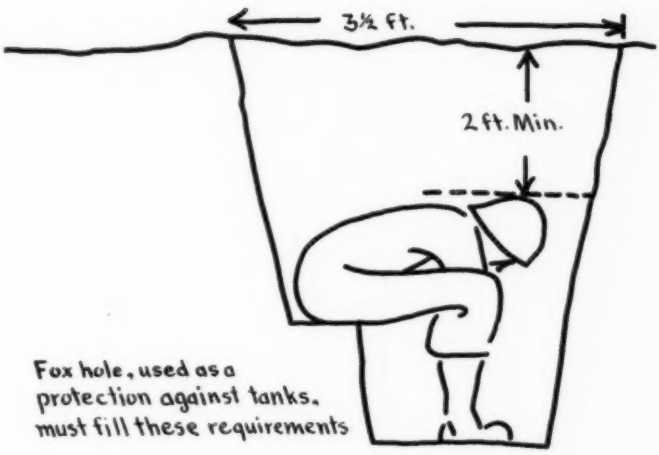


FIGURE 16.

Sketches such as this simplify and clarify instruction, and can be drawn in less time than a verbal description would require, yet leave a more lasting impression.

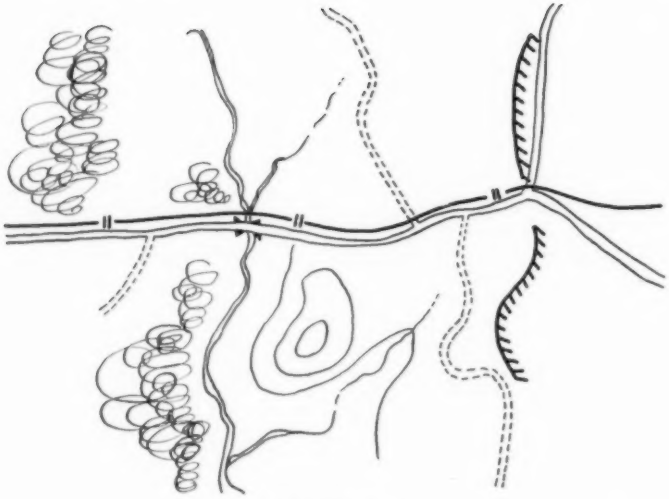


FIGURE 17.

This type of sketch, hastily drawn on a blackboard, will make a situation much clearer.

HAND-DRAWN AIDS

Hand-drawn aids to instruction do not require elaborate material. Wrapping paper, colored writing or drawing inks, (or preferably show card or "speedball" inks, which are opaque) and a few brushes or large lettering pens are all that are needed.

A check of the members of an organization will frequently disclose one or more men with sufficient artistic ability or previous experience to produce charts, diagrams, maps, cartoons, and so forth, of varying elaborateness.

Refinements such as pull-off-sections, which are removed to uncover new portions as the instruction progresses, moving parts to demonstrate changes, and detachable symbols can be added when desirable.

The size of lettering and symbols as well as the width of lines used in making charts and diagrams should be checked to insure that all will be visible to the most distant member of the class.

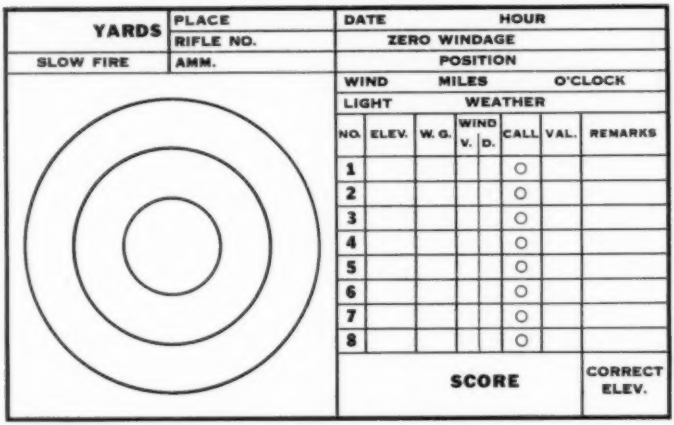


FIGURE 18.

This enlarged page of a score book is a valuable aid to instruction in its use.

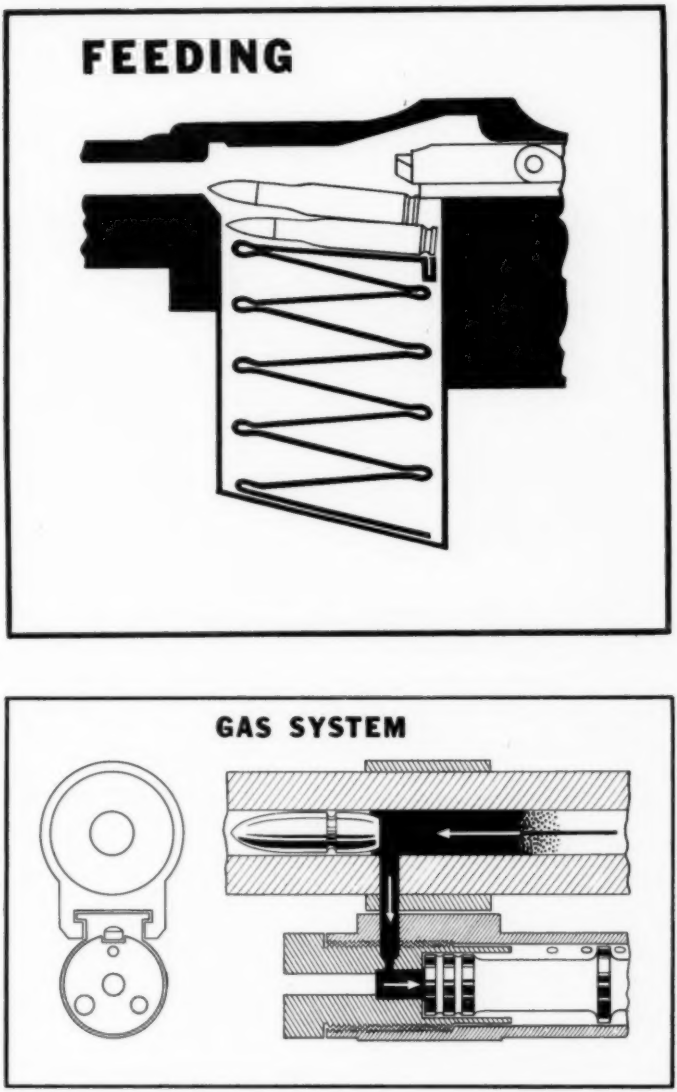


FIGURE 19.

Mechanical parts and functioning can be shown best by visual means.

FIGURE 20.

Thumb-tacked symbols allow a map to be used often in connection with different problems. They can be moved as a situation changes.

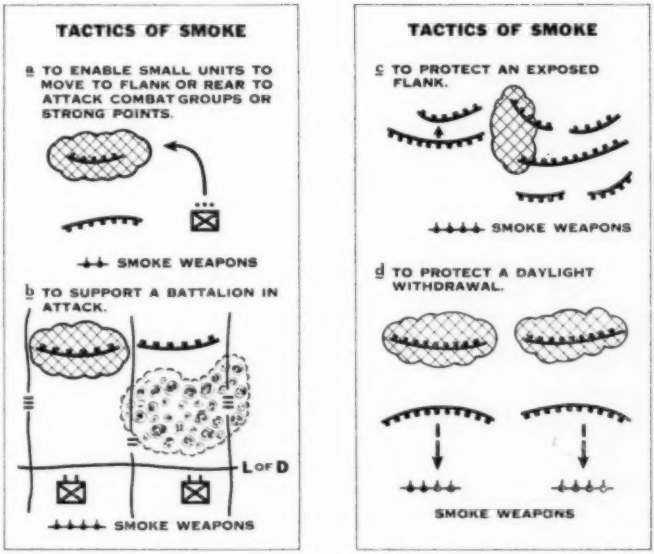

TACTICS OF SMOKE
a TO ENABLE SMALL UNITS TO MOVE TO FLANK OR REAR TO ATTACK COMBAT GROUPS OR STRONG POINTS.
SMOKE WEAPONS
b TO SUPPORT A BATTALION IN ATTACK.
L OF D
SMOKE WEAPONS
TACTICS OF SMOKE
c TO PROTECT AN EXPOSED FLANK.
SMOKE WEAPONS
d TO PROTECT A DAYLIGHT WITHDRAWAL.
SMOKE WEAPONS

FIGURE 21.

Charts and diagrams can be combined.

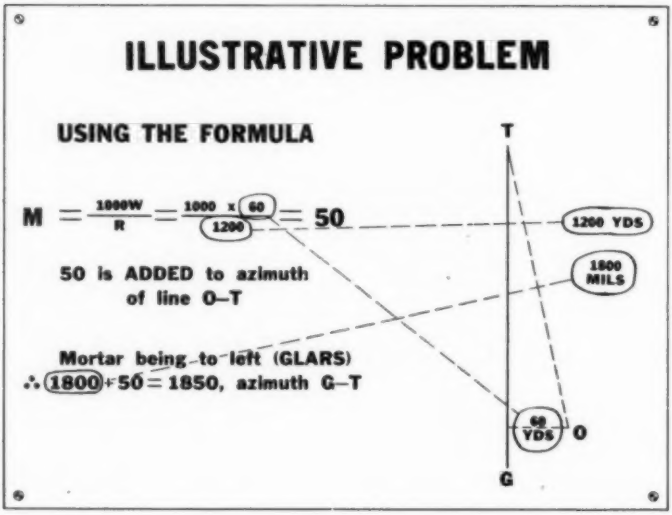


FIGURE 22.
Another use of the combination chart and diagram.

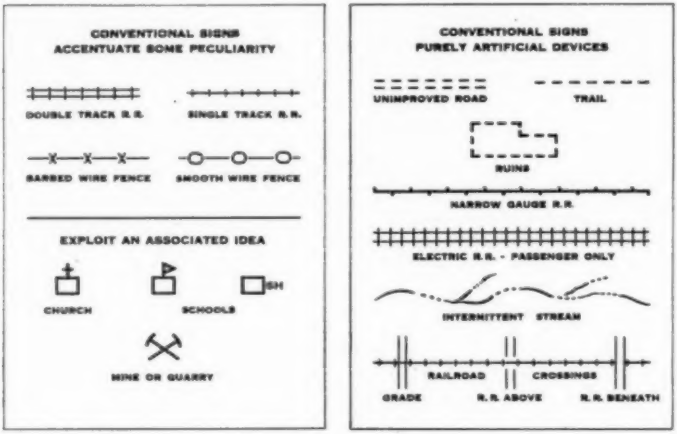


FIGURE 23.
Conventional signs are readily taught by using charts.

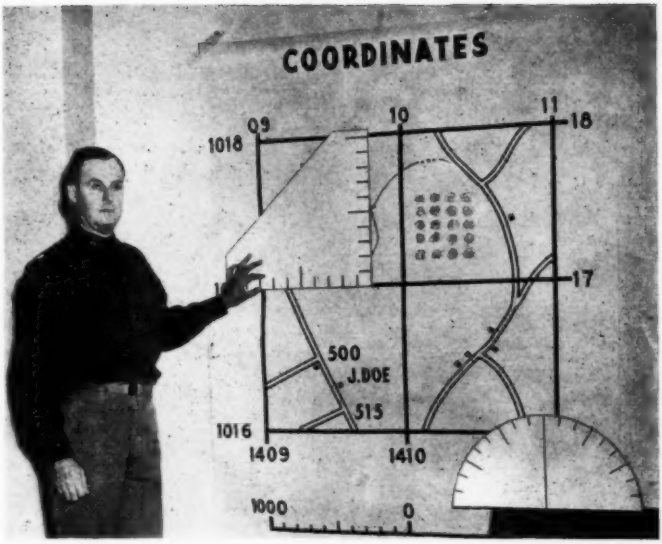


FIGURE 24.

This enlarged coordinate square and protractor are valuable in teaching map reading.

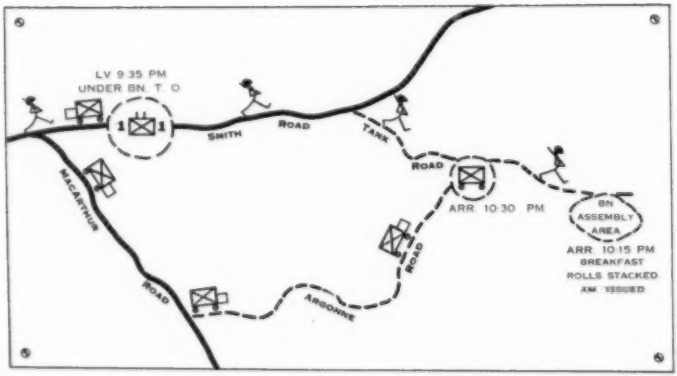


FIGURE 25.

This skeletonized graphic situation map shows the essentials only. Attention is not distracted by unimportant details, and the picture is clear and rapidly grasped.

The Ordnance Department issues wall charts on the following subjects:

U. S. Rifle, Caliber .30, M1

U. S. Rifle, Caliber .30, M1903

Automatic Pistol, Caliber .45, M1911

Browning Automatic Rifle, Caliber .30, M1918

Browning Machine Gun, Caliber .30, M1917

Browning Machine Gun, Caliber .50, M2

81-mm Mortar, M1, Ammunition

60-mm Mortar, M1, M2; Ammunition

37-mm Gun, M3, M5; Ammunition

MODELS

Models are of great use if facilities available permit their construction. Many simple models can be constructed from scrap material by the average company artificer. They enable the class to see things in three dimensions, and some can have the added attention-getting factor of motion. Small-scale models of large things, as well as large-scale models of small things, make possible instruction in almost every phase of military study.

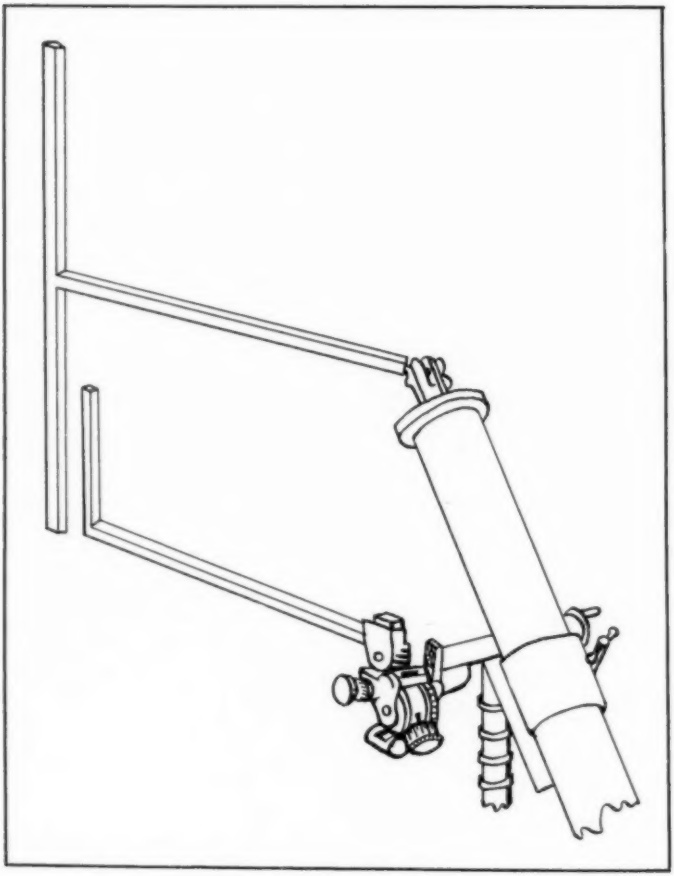


FIGURE 26.

This "Cook Aiming Demonstrator" is a valuable aid in showing the functioning of the M-4 mortar sight. It is easily made yet is a valuable addition to training.

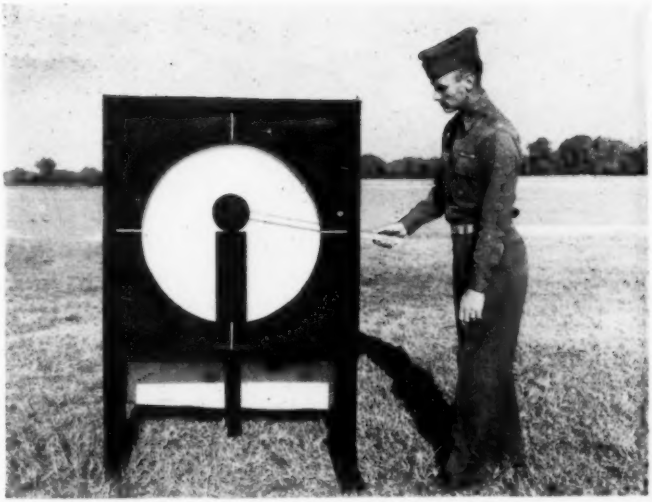


FIGURE 27.

This device is a means of showing the relationship of the three elements of aiming.

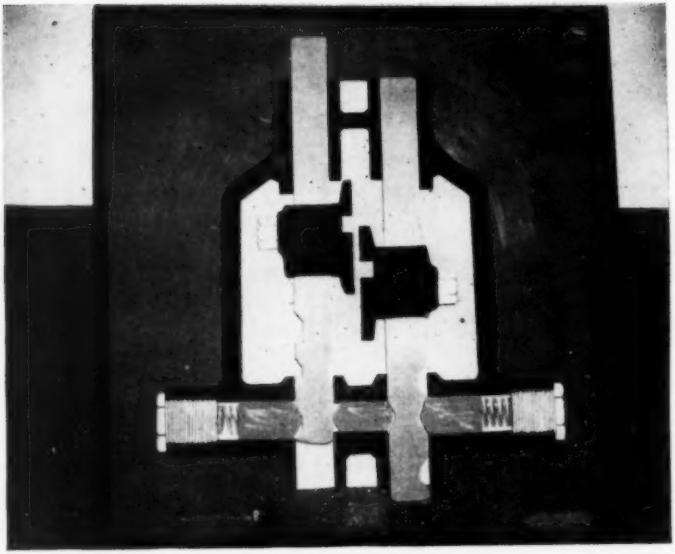


FIGURE 28.

Models with a few moving parts can be made easily with a jig-saw and plywood, and add greatly to the effectiveness of the demonstration. Color adds to the effectiveness of models.

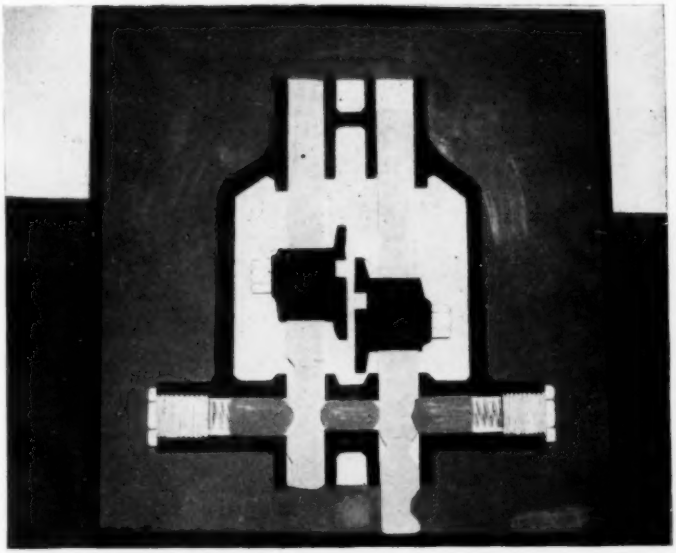


FIGURE 29.

This is the same movable model shown in figure 28, moved to a different position.

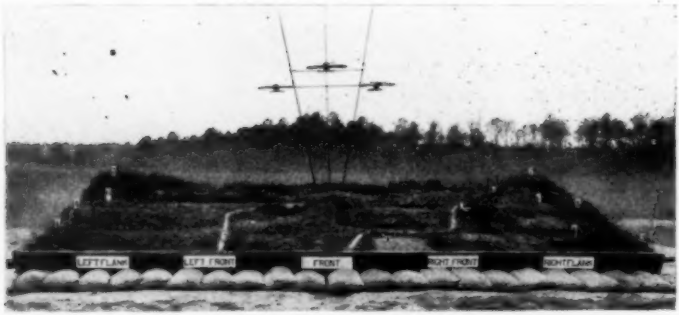


FIGURE 30.

The miniature (cal. .22 rifle) field-firing range for teaching technique of fire is in reality a large landscaped sand-table.

FIGURE 31.

This shows the side of the miniature field-firing range, with a machine gun added to give realistic sound effects.

MODIFIED EQUIPMENT

Often the regular equipment can be modified to simplify the instruction, and thus help the student.

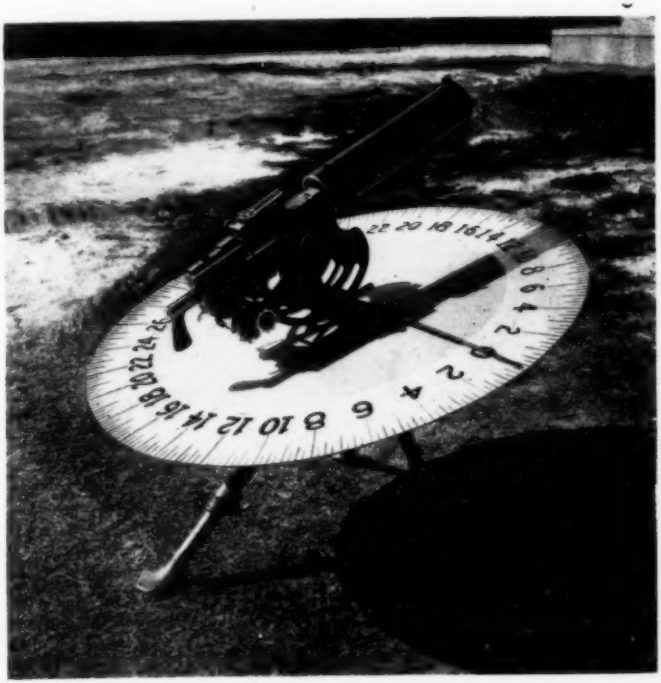


FIGURE 32.

This modified machine gun is used to demonstrate the steps in measuring horizontal angles.

DEMONSTRATIONS

Demonstrations are among the best aids to teaching. They may combine both seeing and hearing, and give a realism not otherwise obtainable. They may well be employed in teaching every phase of military training from the school of the soldier and the manual of arms to complicated field problems.

Usually no special equipment is required for a demonstration, but considerable advance preparation is necessary. A scenario, showing the actions and spoken parts, if any, of all personnel must be prepared. Since a demonstration should be, first of all, as nearly perfect as possible, the personnel involved should be rehearsed so as to be thoroughly proficient in the performance of their tasks.

A well-arranged running comment is a great asset to a demonstration, while extemporaneous remarks may ruin the whole effect.

Demonstrations should proceed slowly enough that each step can be observed and understood, but not so slowly that observers will be bored with waiting.

FIGURE 33.

The demonstration should always follow the explanation.

COUNTY FAIR DEMONSTRATION

County fair demonstrations, in which students observe a number of displays or demonstrations in turn, may be utilized in a number of ways. For example, for the instruction of a large group in the subject of immediate action with a machine gun, a number of stoppages may be set up on different guns, and the class divided into groups which are rotated through the various stations. At each station, a student of the group undergoing instruction thereat is called upon to examine the gun, diagnose the stoppage and perform the appropriate immediate action, with the remainder of the group acting as observers. Students observing the action are then called upon to criticize the performance. The groups are then rotated and the procedure repeated.

This form of instruction is particularly valuable for conducting practical tests. Various displays of faulty equipment or demonstrations of technique are laid out and numbered to correspond with the list of questions furnished the students. Students undergoing the test move from one display or station to another, diagnose the trouble or observe the demonstration and indicate the errors, if any.

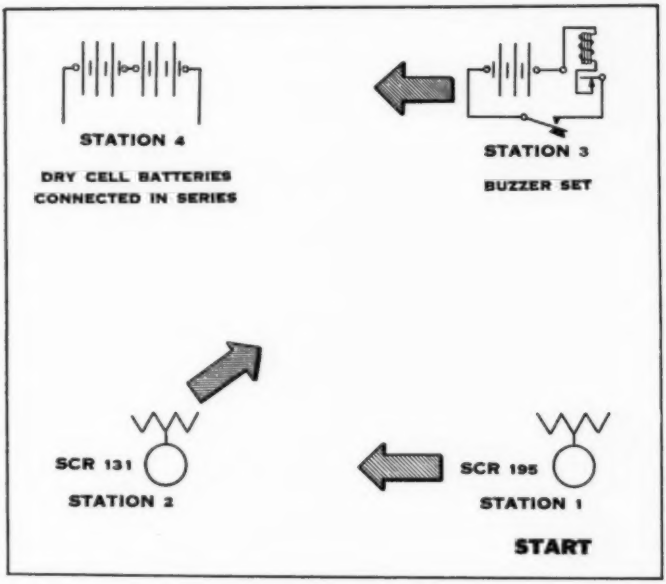


FIGURE 34.
Diagrammatic layout for "County Fair" type test.

FIGURE 35.
Students undergoing "County Fair" test with the layout shown in Figure 34.

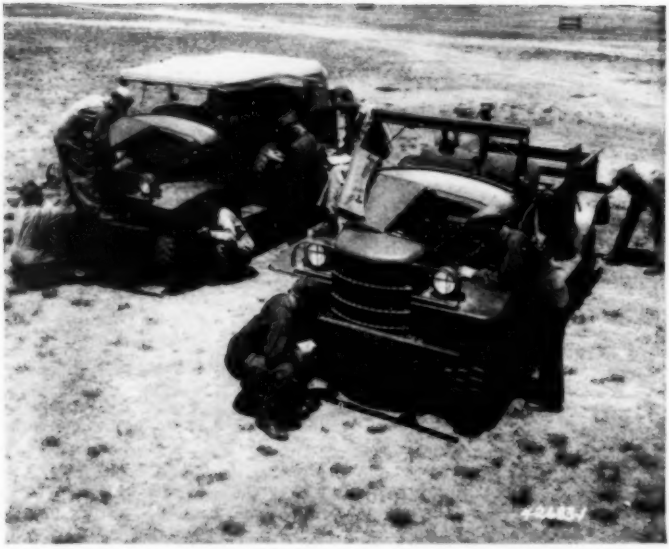


FIGURE 36.

A "County Fair" type test being employed in a course in motor maintenance.

PROJECTED VISUAL AIDS

Projected visual aids provided for use by the Army include:

Training films
Film strips
Opaque projectors

All of these visual training aids have a common disadvantage in that they normally require a darkened room. However, the conception that they must be employed only in a specialiy built room or auditorium, such as a theater, is in error. Good results may even be obtained outdoors on a dark day. When used indoors in a dark, poorly ventilated room, students are prone to become drowsy. By keeping the projected image small, considerable light can be admitted to the room, provided it does not fall directly on the screen. Frequent breaks should be planned, during which the subject matter previously shown is discussed or a quiz conducted to emphasize important points. This procedure has the added advantage of displacing any impression which the students may have had that the training film or other projected material is a form of entertainment.

With all projected aids the projector should be placed so as to avoid head shadows on the screen, and the arrangement of class, projector and screen must permit the screen to be clearly visible to all without undue distortion.

TRAINING FILMS

Training films are valuable instructional aids. They should be integrated with the planned training program and not merely used as an emergency or substitute form of training.

Sound equipment (16-mm) is provided in the division signal company of infantry divisions for units assigned thereto, and in the headquarters and headquarters companies of separate regiments and battalions. Training films may be obtained either from the corps area library or from a post, camp or station sublibrary. Training films which are available are listed in FM 21-6. However, since additional films are becoming available rapidly, current War Department Training Circulars should be consulted for recent additions.

The increasing use of amateur "movie" cameras opens a new field of almost unlimited possibilities. Action pictures of an organization may be used for instructional purposes in a manner similar to the standard training films or as an especially valuable form of critique. This latter use is now being employed almost universally by football coaches, many of whom devote a considerable portion of the practice each Monday during the football season to a showing of the film of the previous Saturday's game.

FIGURE 37.

Either sound or silent film can be used in the issue 16-mm projector. It will operate from any 110-115 volt AC outlet.

FILM STRIPS

Film strips are the latest addition to the projected visual aids issued for use by the army. While they perform the same function as the old familiar glass lantern slides, they offer many advantages over them. Unlike slides, film strips are light, unbreakable, easy to carry, and can be projected for any period desired without danger of cracking from the heat of the projector. However, if roughly handled they are easily scratched. Film strips, like motion pictures, should be previewed before being used. Although titles and some explanatory material is included with the pictures, film strips should be used to illustrate a lecture or conference being given by the instructor. They are not intended to be used as a sole means of instruction. One of their outstanding features is that they are arranged in a definite usable sequence and thus assist the instructor in arranging his presentation in a logical manner.

Film-strip projectors are issued to organizations in a manner similar to 16-mm motion-picture projectors but on a basis of one per battalion or similar unit, instead of one per regiment.

Field Manual 21-6 and War Department Training Circulars should be consulted as to the titles of strips available. FM 21-6 contains not only a list of film strips, but also a synopsis of each.

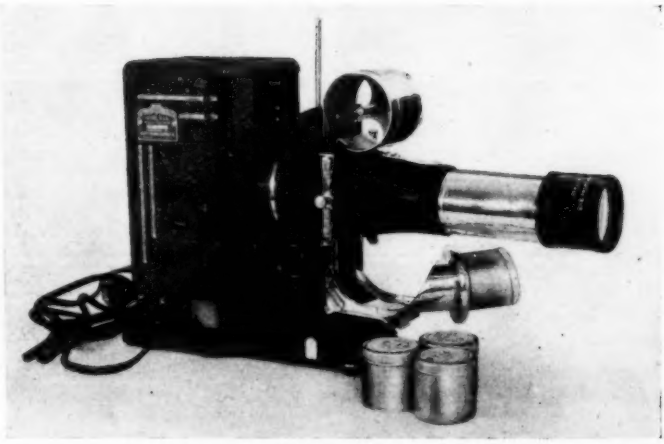


FIGURE 38.

Film strip projector.

FIGURE 39.

The film strip is easily previewed, allowing the instructor to prepare his notes carefully in advance.

OPAQUE PROJECTOR

The opaque projector will project an enlarged image of almost anything which is not transparent and not larger than 6″ x 6″. Pages from books, photographic stills, maps, diagrams, and small pieces of equipment, can be projected greatly enlarged on a screen.

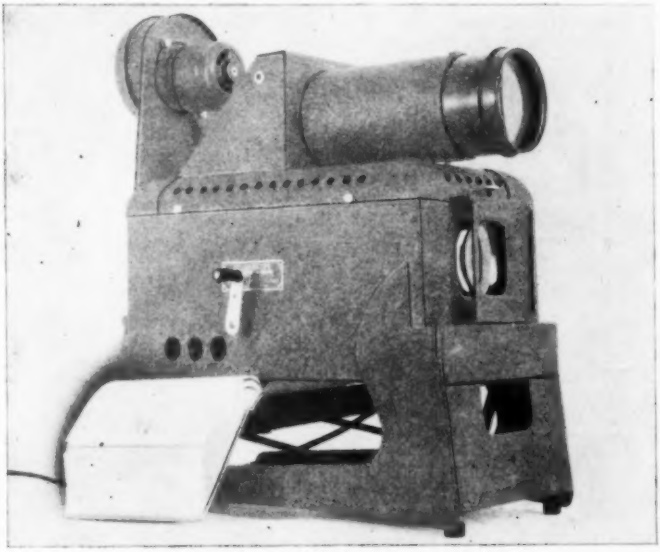


FIGURE 40.

The opaque projector being used to project a page from a book.

WITH PLATOON IN WOODS SCOUTS REACH OPEN AND SEE HOUSE AHEAD. THEY SIGNAL HALT, MEANING THAT THE PLATOON SHOULD NOT ADVANCE BEYOND THIS POINT. RECONNAISSANCE SHOWS HOUSE TO BE CLEAR. SCOUTS SIGNAL FORWARD AND PROCEED
CROSSING OPEN SPACE SCOUT SEES POSITION FROM WHICH MACHINE GUN MAY SWEEP THIS AREA. HE SIGNALS DOUBLE TIME AND POINTS TO THE MG POSITION, MEANING THIS AREA IN DANGER. FROM THAT POINT PLATOON SHOULD HURRY ACROSS
SCOUT RECONNOITERS FOR A SHORT DISTANCE INTO WOODS, FINDING EDGE OF WOODS TO BE UNOCCUPIED. A SCOUT RETURNS TO EDGE OF WOODS AND SIGNALS "FORWARD", THEN BOTH ENTER WOODS AND WAIT FOR PLATOON TO CLOSE UP

Figure 70.—Conduct of scouts during advance.
187

FIGURE 40-a.

This sort of illustration may be projected from a manual with the opaque projector, to show to the class as a whole something which would otherwise require individual study.

FIGURE 41.

A special attachment permits the opaque projector to be used for the projection of film strips.

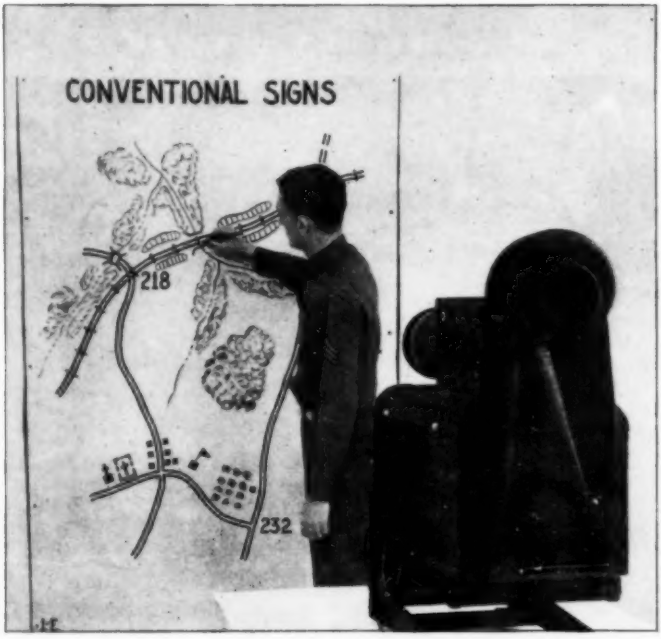


FIGURE 42.

The opaque projector can also be used in chart making, by projecting an image to a sheet of paper, and drawing the enlarged picture.

SEEING IS BELIEVING—ONE PICTURE IS WORTH 10,000 WORDS.

CHAPTER 4

The Infantry Battalion, Rifle, In The Attack

(ILLUSTRATIVE MAP EXERCISE)

(AN INFANTRY SCHOOL TEACHING)

PURPOSE

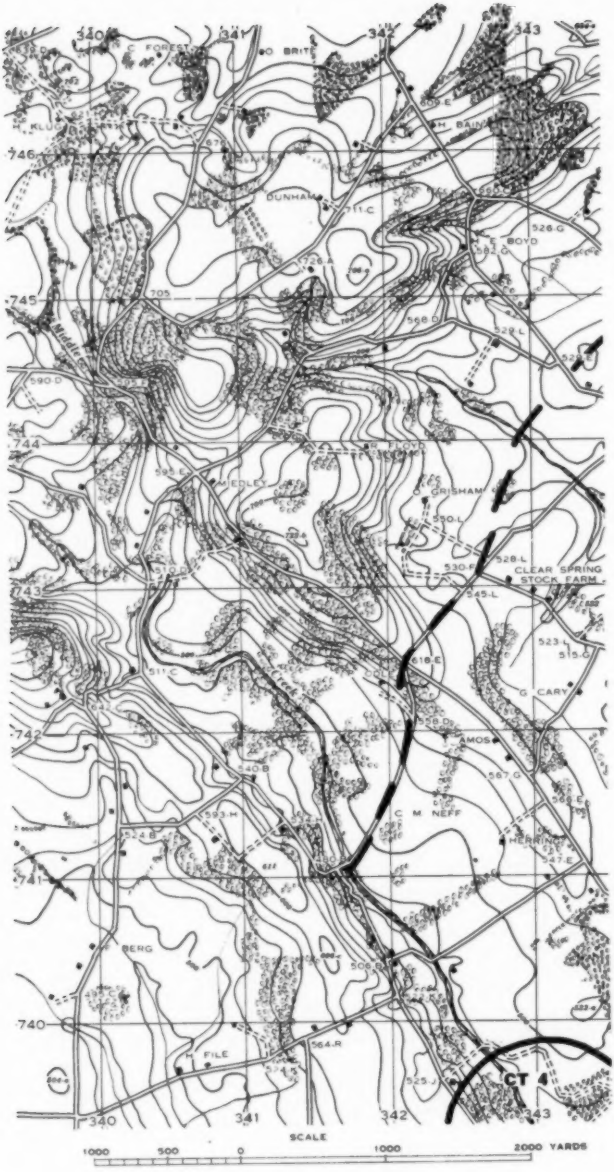
This map exercise has been designed to illustrate:

1. Troop leading by the commander of an interior rifle battalion in the preparation for and during the conduct of an attack.
2. The step by step development of the commander's plan of attack.
3. The employment and coordination of the infantry and artillery supporting fires in the attack.
4. The antiaircraft and antitank protection provided the battalion prior to the attack.
5. The control of the movement of the battalion to its attack position.
6. The use of the supporting fires of adjacent units to assist the attack of a unit unable to advance.
7. The use of the battalion reserve in the zone of action of an adjacent unit to further the attack of the battalion.

SITUATION

MAP: Map A, Figure 43.

The 1st Infantry is part of a large Blue force which has been marching toward the northwest for several days. Hostile combat aviation has been active throughout this march. Leading elements of the Blue force, covering the advance of the main body, made contact early this morning with hostile covering forces and attacked to drive them in.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DUNHAM
BOYD
MIEDLEY
GRISHAM
CLEAR SPRING
STOCK FARM
CARY
AMOS
C M NEFF
BERG
FILE
CT 4
SCALE
1000 500 0 1000 2000 YARDS

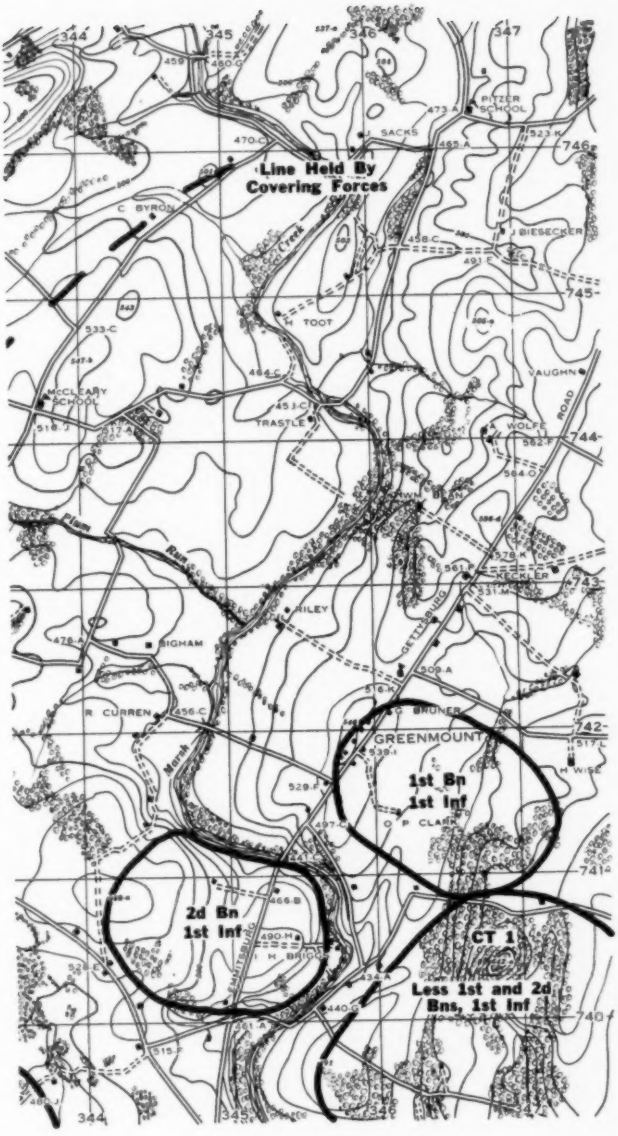


FIGURE 43.—Map A.

At 12:45 PM Combat Team No. 1 [consisting of the 1st Infantry and the 19th Field Artillery Battalion (105-mm How), all under command of Colonel 1st Infantry], was forced to leave the road because of interdiction fire by hostile medium artillery. Since that time it has advanced across country, with the 1st and 2d Battalions, 1st Infantry, marching abreast in the leading echelon, 2d Battalion on the left, and the 3d Battalion, 1st Infantry following the 1st Battalion.

At 2:50 PM, Lieutenant Colonel 2d Battalion is in the northwest corner of the woods on Hill 491 (45-39). Nearby are Major Executive Officer, Captain S-1, Lieutenant S-2, Captain S-3, Lieutenant S-4, Captain Battalion Surgeon, Captain Company H, and the enlisted personnel and transportation of the battalion headquarters section. The battalion, which is disposed in column of companies in the order: E, F, G, and H, has just halted for the hourly halt under cover of the woods to the southeast. The grouped battalion tactical vehicles (including the battalion section of the regimental ammunition train), except the weapon carriers of the elements of Company H and the Battalion Antitank Platoon which are engaged on antiaircraft and antitank security missions, are advancing by bounds in rear of the battalion. They are under command of Lieutenant Battalion Transport Officer.

At this time, a regimental messenger hands Lieutenant Colonel 2d Battalion a map (Map A, Figure 43) and a message which reads as follows:

"Blue covering forces holding line shown on map in contact with enemy. CT 1 occupies assembly area without delay. Assembly areas of this CT and of CT 4 as shown on map. Regiment will attack tomorrow morning with 1st and 2d Battalions in attacking echelon. Report to me at RJ 515-G (43-42) immediately for orders. (Signed) Colonel 1st Infantry."

FIRST REQUIREMENT

Actions taken and orders actually issued by Lieutenant Colonel 2d Battalion, between 2:50 PM and the time he arrives at RJ 515-G.

A SOLUTION OF FIRST REQUIREMENT

MAPS: Map A, Figure 43.
Map B, Figure 44.

Action taken and orders as actually issued by Lieutenant Colonel 2d Battalion:

1. Reads the message received from the regimental commander to the assembled staff mentioned previously. Points out on the map, (Map A, Figure 43) the location of the battalion assembly area and then issues the following instructions:

a. To Captain S-3: "The staff sergeant (operations), an orderly, and yourself will go with me in one of the ¼-ton trucks. Be ready to leave in five minutes."

b. To Captain S-1: "Follow me in one of the ¼-ton trucks with Lieutenant S-2 and Captain Battalion Surgeon."

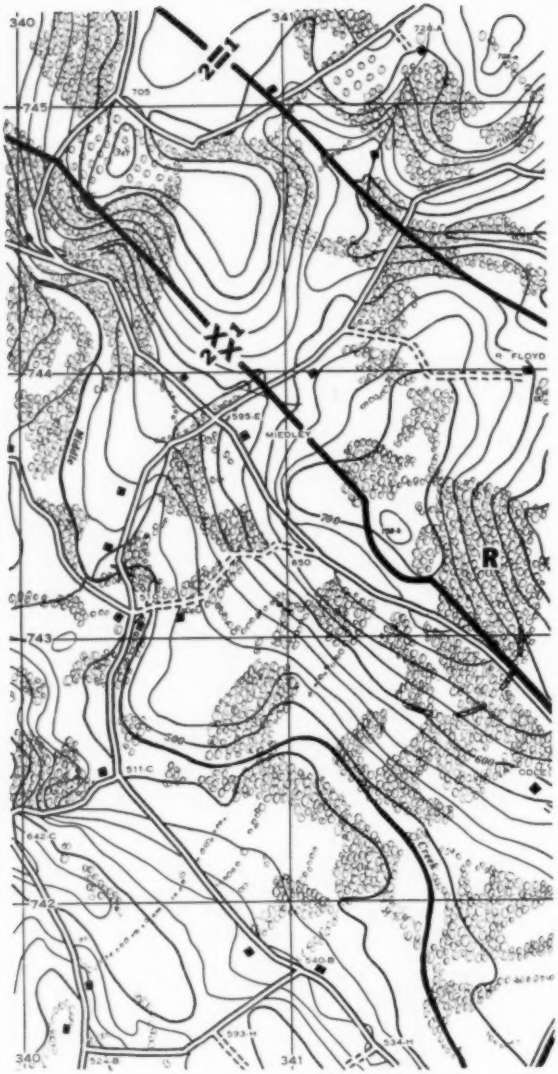
c. To Captain Company H: "You will accompany me in your own transportation."

d. To Major Executive Officer: "You've heard my instructions. Take charge of the battalion in my absence. I will leave this map with you; I have an extra copy. Resume the march at three o'clock and occupy the assembly area, promptly. Place Companies E and F in the woods just east of RJ 528-E (44-40), Company G in the woods 300 yards northeast of RJ 515-F and Company H in the woods about 300 yards southeast of CR 461-A (44-40). Local security along the Hill 568-a (44-40)—RJ 515-F ridge (pointing):

"Air guards will be posted at once. Antiaircraft protection will be furnished by one section of heavy machine guns at each of the following points (pointing): Hill 568-a, the nose 200 yards northwest of RJ 515-F, the hill just south of RJ 490-H (45-40), and this hill we are now on (Hill 491).

"Antitank protection against attacks from the north and west will be furnished by one 37-mm antitank gun section at each of the following points (pointing): Hill 568-a and the nose 200 yards northwest of RJ 515-F.

"Are there any questions?"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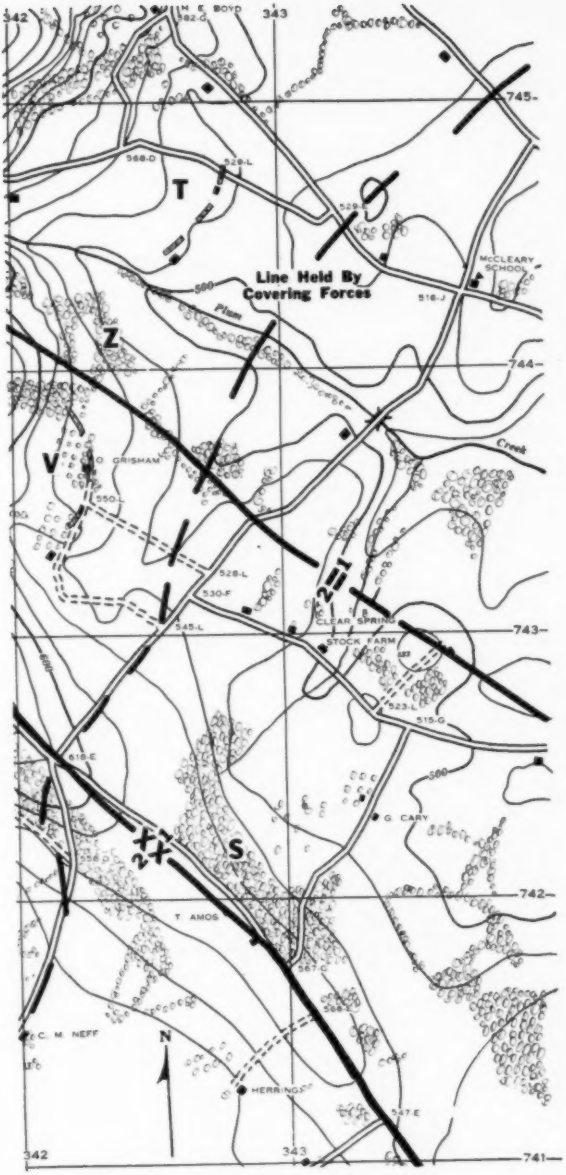


FIGURE 44.—Map B.

2. Proceeds in a ¼-ton truck across country to RJ 440-G (45-40), by road to RJ 497-C (45-41), across country to the bridge at (44.9-42.1) and by road to the house at (44.0-42.5). Leaves the ¼-ton trucks and the command truck under cover of the trees near the road bend, and moves forward on foot, accompanied by his party, arriving at RJ 515-G at 3:15 PM.

DISCUSSION OF FIRST REQUIREMENT

Lieutenant Colonel, 2d Battalion, upon receipt of the message from the regimental commander, should assemble the available members of his staff, orient them on the map and explain the situation. This orientation provides a background to the staff officers concerned for any future fragmentary orders or instructions issued by the commanding officer.

His decision as to the personnel to accompany him, when he reports to the regimental commander, is based primarily upon the use that he expects to make of them on essential reconnaissance missions.

Usually, the battalion commander will not have sufficient information on which he can determine an exact allocation of areas to his units in the assembly area. He should be as specific in his orders for the occupation of the assembly area as his information will permit. In this case, his observation from Hill 491 of the general area assigned by the regiment to his battalion is such that he can designate the assembly area of each company. Measures for ground security, antiaircraft and antitank defense, are always the responsibility of the battalion commander. Hill 491 provides observation which permits him to designate the localities from which this protection can be provided. The standing operating procedure of the battalion should govern the construction of hasty intrenchments and the posting of an interior guard in assembly areas.

SITUATION, CONTINUED

Major S-3 1st Infantry and Captain Artillery Liaison Officer met Lieutenant Colonel 2d Battalion and his party

near RJ 515-G. Major S-3 1st Infantry introduced Captain Artillery Liaison Officer as the liaison officer with the 2d Battalion, for the attack, and then addressed Lieutenant Colonel 2d Battalion as follows:

"Sir, the regimental commander has directed me to give you the following information and instructions. Here is an operation map (Map B, Figure 44) on which you can follow me.

"Red positions have been located as indicated. Other hostile troops occupy Woods R (41-43) although their exact positions are undetermined.

"Blue covering forces, in contact with the Red position, have been stopped along the general line shown; they will hold their present positions until passed through tomorrow morning. The Command Post of the battalion holding that part of the line in our front is at Clear Spring Stock Farm (43.1-42.9).

"A general attack will be launched at daylight tomorrow. Our regiment will penetrate the hostile position up Plum Creek (1000 yards north of RJ 515-G), capture Hill 766-a (41.8-45.2) and Hill 747 (40.4-44.8), and continue the attack to the northwest.

"Your zone of action is as shown on the operation map.

"Line of departure: Line held by Blue covering force.

"If you will come with me to that hill, (pointing to the hill 150 yards to the west), I will point out some of the terrain features in the regimental zone."

Lieutenant Colonel 2d Battalion with Captain S-3 and Major S-3 1st Infantry moved to the hill 150 yards west of RJ 515-G where the regimental staff officer pointed out on the ground the terrain features visible from that point. He then added: "It is now 3:30 PM. The Colonel wants you to meet him here at 4:15 PM for further orders."

SECOND REQUIREMENT

Actions taken, and orders actually issued by Lieutenant Colonel 2d Battalion, between 3:30 PM and 4:15 PM.

NOTE: Darkness begins tonight at 6:45 PM.

A SOLUTION OF SECOND REQUIREMENT

Map: Map B, Figure 44, Operation Map.

Actions taken and orders as actually issued by Lieutenant Colonel 2d Battalion:

1. Have Captain Battalion Surgeon, Captain S-1, Lieutenant S-2, Captain Artillery Liaison Officer, and Captain Company H join him. On their arrival he orients them as follows:

"Blue covering forces have been stopped along that road, (pointing), by Reds in position near that house, (pointing to O. Grisham), and in those woods, (pointing to Woods R).

"A general attack will be launched at daylight tomorrow.

"We will attack in the zone of action indicated on this operation map, (Map B, Figure 44). The 1st Battalion will attack on our right, the 2d Division will attack on our left.

"Are there any questions?"

2. Issues the following instructions:

a. "Captain S-1, go back to the assembly area in my ¼-ton truck and inform Major Executive Officer of the situation, and direct him to inform the other members of the staff.

"You bring the rifle company commanders, Communication Officer, S-4, Battalion Antitank Officer, and the Battalion Transport Officer back to this point and meet me here at 4:30 PM for further orders. Orient these officers upon arrival."

b. "Captain Company H, I haven't enough information yet to make a definite plan of attack.

"Probably we'll adopt one of these general plans:

"First, to make the main attack of the battalion, initially, in the right part of the zone to capture that Position V (pointing), or second, to make our main attack, initially, on the left to capture those woods, (pointing to R). I will announce basic decisions relative to my plan following receipt of the regimental attack order.

"Meet me here at 4:25 PM prepared to make recommendations for the employment of your company.

"Any questions?"

c. "Captain Battalion Surgeon, be prepared to submit your recommendations to me here, at 4:25 PM.

"Any questions?"

d. To Lieutenant S-2, "Contact the covering force in our zone of action and obtain details of present enemy dispositions and keep me informed on any changes."

e. "Captain Artillery Liaison Officer, you heard my instructions to Captain Company H.

"I want you to accompany me on my reconnaissance so that we may discuss artillery support from a position from which we will have a closer view of the ground over which we are to attack.

3. Moves to the position of Staff Sergeant (Operations) and directs:

"Here is the operation map. (Map B, Figure 44, Operation Map.)

"Make seven sketches of this part of it, (pointing out on the map the area to be included). Give letter designations to these woods (pointing), which will otherwise be hard to describe.

"I'm going forward to the ridge west of Clear Spring Stock Farm on a reconnaissance. I'll return here at 4:15 PM to meet the Colonel. You remain in this vicinity until I return."

4. Accompanied by Captain S-3, the Artillery Liaison Officer, and orderly moves under the cover of the woods north of RJ 515-G to the nearest covering force battalion command post at Clear Spring Stock Farm. He confers with personnel at this command post to learn any additional information of the enemy and of the terrain.

5. Accompanied by Captain S-3, the Artillery Liaison Officer, and orderly moves to the vicinity of the trees about 400 yards to the northwest and from a suitable position observes the terrain in the zone of action of the battalion. He discusses briefly, with the Artillery Liaison Officer, the

details of artillery support for the attack and with Captain S-3 his plan of attack.

6. Accompanied by Captain S-3, the Artillery Liaison Officer, and orderly returns by the same route in time to arrive at the vicinity of RJ 515-G prior to 4:15 PM. After obtaining the operation map, (Map B, Figure 44), from Staff Sergeant (operations) he meets the regimental commander.

DISCUSSION OF SECOND REQUIREMENT

In this situation, the battalion commander has received from a regimental staff officer sufficient information on which to issue a warning order for an attack at daylight tomorrow. Whenever possible, commanders should issue warning orders to enable subordinates to begin their anticipatory planning and reconnaissance in order that upon the receipt of the attack order they can then promptly initiate their respective activities.

He uses a member of his staff (in this case Captain S-1 since he has no important reconnaissance mission to perform at this time) to transmit his warning order and the latest information to the Battalion Executive Officer and those officers of the battalion concerned. This officer will guide the rifle company commanders and the remaining staff officers to the point designated by the battalion commander and will then orient them on the ground. This action will reduce time involved in the issuance of the battalion attack order and afford the maximum possible time for essential reconnaissance by company and staff officers, prior to darkness.

Since the battalion commander has not made his reconnaissance, he is not prepared to announce at this time a tentative plan of attack. In order to facilitate a detailed reconnaissance by Captain Company H for the employment of his company, he informs Captain Company H of the possible attack plans which he is considering.

In order that Captain Battalion Surgeon may make a reconnaissance for the employment of the Battalion Medical Detachment, the Battalion commander directs him to be

prepared to submit his recommendations at a designated time and place prior to the issuance of the attack order.

The sketches the battalion commander orders prepared will reduce the verbiage required in the issuance of his order, will present a graphic picture to those to whom they are issued, and will facilitate control and coordination during the attack. In this case, seven copies appear to be sufficient.

The personnel designated to accompany the battalion commander on his reconnaissance are the Artillery Liaison Officer and S-3 with whom he desires to discuss from advantageous points of observation the fire support to be rendered by the artillery in the case of each plan under consideration. Information which he will obtain by his visit to the CP of the nearest covering force battalion will be invaluable to him in formulating his plan of attack.

The plan of reconnaissance of the battalion commander must be such that it will permit him to observe the essential terrain features within his battalion zone of action and enable him to meet the regimental commander at the time and place designated.

He should obtain the operation map from the Staff Sergeant (operations), so that he may have available a graphic picture of the contemplated attack to facilitate the taking of notes from the regimental attack order.

THIRD REQUIREMENT

Based on the information given him by Major S-3 1st Infantry and on the results of his own personal reconnaissance, Lieutenant Colonel 2d Battalion should by this time have evolved a tentative plan of attack. As Lieutenant Colonel 2d Battalion, give so much of your plan of attack as is indicated by answers to the following questions:

1. *a.* Formation for the attack?

b. Objective(s) assigned to the company or companies in the attacking echelon?

c. In what part of the battalion zone will you make your main attack?

d. From what portion of line of departure will the company or companies of the attacking echelon commence the attack?

2. The location and initial mission of the battalion reserve?

A SOLUTION OF THIRD REQUIREMENT

MAP: Map B, Figure 44.

The tentative plan of Lieutenant Colonel 2d Battalion is as follows:

1. *a. Formation:*—Two companies in the attacking echelon, one in reserve.

b. Objectives:—Right company, hostile position at V. Left company, eastern edge of Woods R.

c. The main attack of the battalion to be made in that portion of the battalion zone, right of RJ 545-L—house at (42.15-43.35).

d. Right company: to cross that portion of the line of departure extending 400 yards left of the battalion right boundary. Left Company: to cross that portion of the line of departure extending 600 yards to the right of the battalion left boundary.

2. *Reserve:* Initial location: vicinity of Clear Spring Stock Farm.

Mission: maintain contact with the 1st Battalion on the right and the 2d Division on the left, employing not to exceed one-half squad on each flank; reconnoiter for routes towards O. Grisham, house on stream at (42.15-43.35), and via Woods S, then along battalion left boundary.

DISCUSSION OF THIRD REQUIREMENT

1. *a.* Lieutenant Colonel 2d Battalion returned from his reconnaissance with a tentative plan in mind. He plans to use two companies in the attacking echelon, with one in reserve. The factors which influence him in tentatively adopting this plan are the frontage assigned, which is approximately 1150 yards; the depth of the attack from the line of departure to the regimental objective (Hill 747),

which is about 2750 yards; the terrain; and the known hostile dispositions in his zone of action. This tentative formation provides for a strong attack in depth. An interior battalion on usual types of terrain can make a decisive attack against a partially organized position(s), on a frontage of 1000 yards, with two companies in the attacking echelon. The frontage assigned to this battalion is slightly in excess of the usual frontage assigned. This slight excess does not, when considered in view of the nature of the terrain, justify commitment of additional rifle elements. Excessive frontages are not covered by extending intervals between individuals, but by covering the gaps between units by fire or by patrols. A careful analysis of this terrain indicates that a gap, intentionally created, between companies of the attacking echelon, will provide for the supporting fire of one caliber .30 machine gun platoon to be placed on Woods R.

b. A company objective should be the first known or suspected hostile resistance in the assigned zone of action of the company, should be within sight of the line or area of departure, and subject to observed fires of organic supporting weapons. These requirements are met in the battalion commander's tentative plan to assign to the right company, as its objective, the enemy position at V and to assign to the left company, as its objective, the eastern edge of woods R.

c. The main attack of a battalion should be made, whenever possible, in that part of its zone of action in which the enemy fires and observation are restricted, and this part of the zone of action should possess for the attacker, comparatively, the most cover and concealment. The main attack should, whenever possible, be made against weakness. Thus, a careful analysis of the terrain in the zone of action of this battalion indicates that the ground in front of Position V is rolling, with slight ridges east of O. Grisham and southeast of RJ 550-L affording some defilade from enemy small-arms fire. Woods on the extreme right flank afford a covered route towards Position V, and a small stream in the

center of the battalion zone of action (if fire from Woods R can be neutralized) also affords a route of approach towards this position. On the other hand, the ground in front of Woods R slopes evenly, with little cover, and is subject to more effective grazing fires than that part of the zone of action in front of Position V. Hence, the terrain favors the main attack in the right half of the battalion zone of action.

The hostile organized position at V and the hostile elements in Woods R, although the exact locations are not definitely determined, appear to possess equally strong defensive capabilities. Whenever possible, the bulk of supporting fires should be placed in the zone of action of the company making the main attack. In this situation the terrain affords positions and observation from which more effective supporting fires can be placed on Position V than on Woods R. The Battalion commander is aware that the regiment will make its main attack in the zone of action of the battalion on his right. The capture of Position V will materially assist the main attack of the regiment. After a careful analysis of the foregoing factors, he plans to make the main attack of the battalion on the right and the secondary attack on the left.

d. In conformity with the principles that main attacks are made in narrow zones of action, and secondary attacks in wide zones of action, he plans to assign to the right attacking company, a frontage of 400 yards, and to the left attacking company, a frontage of 600 yards. The gap of 150 yards in the center, intentionally created, will greatly facilitate the use of heavy machine guns in supporting the attack against Woods R. This disposition of the companies of the attacking echelon favors a strong attack against Position V, with minimum losses to the companies involved.

2. The initial location of the reserve should afford defilade from small arms fire, concealment from ground and air, and provide readiness to exploit initial success or add impetus to the main attack.

The initial missions usually assigned to the reserve are: to protect the flanks; to maintain contact with adjacent

units; to initiate reconnaissance of routes to the front and flanks so as to facilitate the prompt movement of the reserve to a threatened locality, or to expedite its commitment. The location and initial missions which the battalion commander plans to assign to the battalion reserve favors the accomplishment of its initial mission and possible subsequent employment.

SITUATION, CONTINUED

At 4:15 PM, Colonel 1st Infantry, in the presence of his three battalion commanders and certain other officers, issued an oral order at a point on the hill 150 yards west of RJ 515-G. Extracts from this order follow:

"You know the situation.

"The division artillery fires a preparation on the hostile forward positions beginning at 5:50 AM and lifting on signal or call from leading battalion commanders.

"The 19th Field Artillery Battalion is in direct support of this regiment. The 2d Division attacks on our left.

"Our regiment, with Company A, 901st Chemical Regiment, attached, will attack up Plum Creek, penetrating the hostile position, capture the J. Dunham (41-45)—Hill 747 ridge, and continue the attack to the northwest.

"Time of attack: 6:05 AM.

"The 1st Battalion, with Company A, 901st Chemical Regiment (less 2d Platoon) attached, will advance up Plum Creek, capture Hill 766-a and the high ground west of J. Dunham, and continue the attack to the northwest.

"The 2d Battalion, with 2d Platoon, Company A, 901st Chemical Regiment, attached, will capture Hills 722-b and 747, and continue the attack to the northwest.

"The 3d Battalion, in reserve, * * *

"The Antitank Company, * * *

"The Cannon Company: one platoon 75-mm (How) will support the attack of each of the leading battalions * * *

"Command posts:

* * *

"2d Battalion: northwest corner of Woods S, (pointing).

"Are there any questions?"

Upon the conclusion of the regimental commander's order, Lieutenant Colonel 2d Battalion conferred briefly with Lieutenant Colonel 1st Battalion concerning mutual cooperation and reached an agreement to meet him on Hill 522 (43-42) at 5:30 PM for an interchange of plans.

Lieutenant Colonel 2d Battalion then conferred with Captain Cannon Company relative to the close support to be provided by the 75-mm (How) Platoon of the Cannon Company. During this conversation, Lieutenant 2d Platoon, Cannon Company joined Lieutenant Colonel 2d Battalion. Lieutenant Colonel 2d Battalion informed Lieutenant 2d Platoon, Cannon Company of his tentative plan of attack and directed Captain S-3 to orient the former.

Lieutenant 2d Platoon, Company A, 901st Chemical Regiment, reported to the battalion commander and informed the latter that his platoon would arrive at about 5:30 PM and would carry no chemical ammunition other than smoke shells. He stated that under average conditions of wind and weather, this platoon, with normal ammunition loads, could maintain a screen 800 yards long for 25 minutes.

Captain Artillery Liaison Officer reported that he had received word from the headquarters of the 19th Field Artillery Battalion that an additional light artillery battalion would reinforce the fires of the 19th Field Artillery Battalion and that the 2d Battalion, 1st Infantry, should plan for the fire of two 105-mm howitzer batteries in its zone of advance during the initial phase of the attack. (An area 200 yards in diameter is the maximum which a 105-mm howitzer battery can cover at one time.)

Captain S-1 reported at 4:30 PM accompanied by the rifle company commanders, Lieutenant Antitank Platoon, Lieutenant Communication Officer, and Lieutenant S-4. Captain S-3 assembled them with Captain Company H, Captain Battalion Surgeon, Lieutenant Cannon Platoon, and Lieutenant Battalion Transport Officer and oriented them and covered the substance of the regimental attack order.

Following the orientation by Captain S-3 Lieutenant Colonel 2d Battalion announced his basic plan of attack (see A Solution of Third Requirement) and directed Captain Company H, Lieutenant Antitank Platoon, Lieutenant Cannon Platoon, and Lieutenant Chemical Platoon, to be prepared at 4:50 PM to submit recommendations for the employment of their units to support the announced plan of attack.

At 4:50 PM, the officers listed in the preceding paragraph, reported to Lieutenant Colonel 2d Battalion and submitted the following recommendations:

Captain Company H:

Both heavy machine gun platoons to be emplaced along the south edge of the road between RJ 530-F (42-43) and battalion right boundary. Both platoons to fire, initially, against Position V.

The 81-mm mortar platoon to be emplaced just east of the small woods at (42.95-43.2) and to fire, initially, on Position V.

Lieutenant Antitank Platoon:

The 37-mm Antitank Platoon to be disposed initially as follows: One section emplaced on Hill 522 to protect against attacks from the north and northwest and one section emplaced along the northwest edge of Woods S to protect against mechanized approaches from the direction of Woods R and Position V.

Lieutenant Cannon Platoon:

The 75-mm (How) platoon to occupy initial cover positions in the vicinity of northwestern edge of Woods S, prepared to assist both companies in the attacking echelon by fire on targets of opportunity, with particular attention to the zone of action of the right company.

Lieutenant Chemical Platoon:

The 2d Platoon, Company A, 901st Chemical Regiment, from positions near Clear Spring Stock Farm, to lay a smoke screen on the hostile front line at Position V and along the northeastern edge of Woods R, beginning at the point where the stream leaves this woods and extending

300 yards to the south; this screen to be maintained from H-2 minutes until lifted on signal from the companies in the attacking echelon. When this screen is lifted, platoon to be prepared to screen, on order, the line: point at (41.8-44.3) —point at (41.6-43.6).

FOURTH REQUIREMENT

As Lieutenant Colonel 2d Battalion:

1. Give your plan of supporting artillery fires which you would indicate to the Artillery Liaison Officer, both on the map and during your ground reconnaissance, for the initial phase of the attack, to include the following:

a. Where would the fire be placed when the preparation starts at 5:50 AM?

b. Should any shifting of fires take place during the preparation, and if so, to what target or targets?

c. (1) What measures will you employ to lift preparatory fires?

(2) Who will be responsible for the lifting of fires?

(3) What alternate non-visual means will you employ for lifting these fires?

(4) Where should fires be placed upon completion of of the preparation?

d. What smoke missions, if any, would you request?

2. The action taken by you as Lieutenant Colonel 2d Battalion with respect to the recommendations submitted by:

a. Captain Company H.

b. Lieutenant Antitank Platoon.

c. Lieutenant Cannon Platoon.

d. Lieutenant Chemical Platoon.

A SOLUTION OF FOURTH REQUIREMENT

MAPS: Map C, Figure 45.
Map B, Figure 44.

1. Supporting artillery fires as planned by Lieutenant Colonel, 2d Battalion: (See Figure 45, Map C.) for plan of artillery fires prepared by Captain Artillery Liaison Officer for transmission in the form of an overlay to the artillery battalion fire direction center).

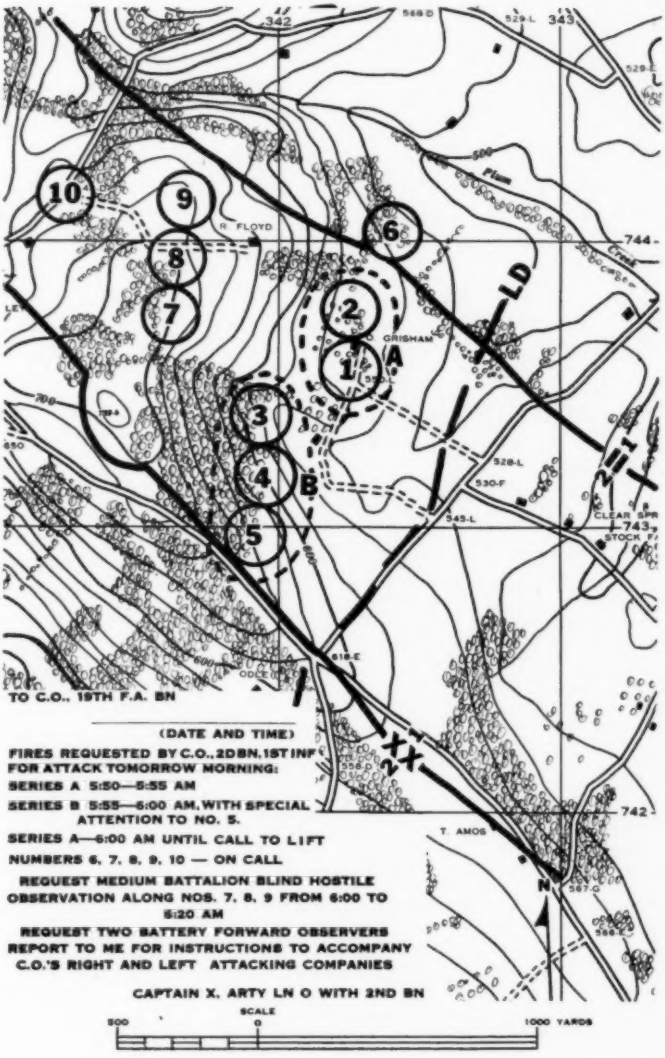


FIGURE 45.—Map C.

a. From 5:50 to 5:55 AM, place the fire of both batteries on Position V.

b. From 5:55 to 6:00 AM, place the fire of both batteries on the eastern edge of Woods R. From 6:00 AM until call or signal to lift, place the fire of both batteries again on Position V.

c. (1) Pyrotechnic signal—white star parachute.

(2) Captain right attacking company to fire the signal for lifting artillery fires.

(3) An artillery battery forward observer with radio to accompany captain right company to provide an alternate non-visual means.

(4) Upon completion of preparatory fires, the artillery to be prepared to fire on targets of opportunity in the zone of advance of the 2d Battallion. The southern edge of Woods Z, the northern nose of Hill 722-b, and the road junction at (41.25-44.15) are possible locations for which fires should be prepared.

d. Request medium artillery (155-mm howitzer), in general support, to blind hostile observation on northern nose of Hill 722-b along the line: (41.8-44.3)—(41.6-43.6) from 6:00 AM until 6:20 AM.

2. Lieutenant Colonel 2d Battalion took action as follows with respect to recommendations submitted:

a. Directs the following changes in the plan for the employment of the platoons of Company H:

(1) One caliber .30 platoon, from a position area about 100 yards northeast of RJ 528-L, will fire on Position V. It will be prepared when its fire is masked, to fire on the eastern edge of Woods R.

(2) One caliber .30 platoon from a position area between RJ 545-L and RJ 530-F, will fire on the eastern edge of Woods R. It will be prepared, on order, to support the left attacking company.

(3) The 81-mm mortar platoon (less one section), from a position area in the draw 150 yards northeast of Clear Spring Stock Farm, will, beginning at H-5, fire on definitely

located targets on Position V. It will be prepared to shift its fire to targets in the eastern edge of Woods R, on order.

(4) One section of the 81-mm mortar platoon, from a position area in the wooded draw 400 yards southwest of the Clear Spring Stock Farm, will, beginning at H-2, smoke the eastern edge of Woods R, from the battalion left boundary to a point 300 yards north thereof.

b. Directs changes as noted below in the plan for the employment of the 37-mm Antitank Platoon:

(1) The section to be emplaced on Hill 522 to occupy a cover position in the woods 200 yards east of RJ 528-L, and protect against mechanized attack, from the direction of Positions V and Z.

(2) The other section, cover position and principal directions of fire, approved.

c. The recommendations for the employment of the Cannon Platoon, approved.

d. The recommendations for the employment of the Chemical Platoon, approved.

DISCUSSION OF FOURTH REQUIREMENT

1. In order that the fires of the artillery actually assist the advance of the infantry, the plan of supporting artillery fires must fit the infantry battalion commander's plan of attack. To achieve this end, the infantry battalion commander must plan these fires on the map and on the ground during reconnaisance with the artillery liaison officer, at the earliest practicable moment. The 1st Division has ordered a preparation on the hostile forward position beginning at 5:50 AM and lifting on signal or call from leading battalion commanders. The infantry regimental commander decides what proportion of the artillery available to his regiment for direct support will fire the preparation in each battalion zone of action. In this attack he has one light artillery battalion in direct support and one additional light artillery battalion reinforcing the fires of the direct support battalion; a total of six batteries of which he allots one-third to the 2d Battalion. It is now the responsibility of

the commanding officer of the 2d Battalion to arrange with his artillery liaison officer for the detailed placing of this amount of fire and for all necessary plans for its shifting and lifting. The battalion commander would like to cover his entire front, but he does not have sufficient artillery; therefore, he must decide where the fire will best assist his advance and reduce his casualties. He considers that Position V is the initial strong enemy resistance against which he is to make his main attack and therefore starts to soften that up first. He might have kept the artillery on that position continuously, but with the information that there are some hostile forces in Woods R, he places fire for a few minutes on that position and then returns to Position V and holds the fire there until he is ready to make his assault on that position. The employment of one battery on Woods R and one battery on Position V during the entire preparation would have been an undesirable employment of the artillery as it is better to use the artillery in heavy concentrations and shift from target to target with sudden and surprise effect than to use continuous light concentrations. He correctly designated his right attacking company commander to signal and call for the final lift of the fire from Position V as that company commander will be in the best position to judge the last possible moment for the lifting of the fire. If artillery fire is lifted from an enemy position too far in advance of the assault on the position, a large part of the effect of the fire is lost as it gives the enemy an opportunity to recover from its effects and to better prepare himself to receive the infantry assault.

An alternate non-visual means for lifting artillery fire should always be provided, due to the possibility that visual signals might not be observed or they might fail to function properly. In this instance, an artillery battery forward observer with a radio was detailed to accompany Captain right company, in order to provide an alternate non-visual means.

Since no hostile positions have been located beyond Position V and Woods R, fires beyond those points cannot be prearranged except as to probable and approximate location. From the southern edge of Woods Z in the zone of the 1st Battalion, effective hostile fire can be brought to bear on the 2d Battalion both before and after the capture of Position V. The commander of the 2d Battalion, therefore, asks that fire be prepared to be placed there on call. This fire will not be delivered upon call, however, until the 19th Field Artillery Battalion fire direction center has verified the fact that it will not interfere with the advance of the 1st Battalion. This verification can be quickly accomplished through the artillery liaison officer with the commander of the 1st Battalion. Enemy fire from the eastern edge of the northern nose of Hill 722-b will seriously interfere with the further advance of the right attacking company and capture of Position V; so the commander of the 2d Battalion correctly suggests that the artillery be prepared to fire there on call. If the enemy withdraws or if he attempts to bring up reinforcements, it would certainly be desirable to prevent his using the road junction at (41.25-44-15) and with that in view, interdiction fire is prepared to be placed there on call.

Smoke fired by the 155-mm howitzer is an effective way to blind enemy observation. From a study of the map and a look at the terrain, the 2d Battalion Commander sees that the enemy will have a good part of the zone of advance of the battalion under observation from the northern nose of Hill 722-b. He has decided to employ the chemical troops to smoke the enemy position in his immediate front and he has properly requested that this hostile observation be blinded by the artillery in general support from 6:00 AM until 6:20 AM.

2. *a.* Lieutenant Colonel 2d Battalion rejects the recommendations of Captain Company H for the employment of the caliber .30 machine gun platoons for the following reasons:

(1) The area between RJ 530-F and the battalion right boundary affords limited position areas for caliber .30

machine guns and would necessitate the delivery of overhead fire by both platoons. From that area, the fire of the platoon assigned the mission of placing its fire on Woods R would be masked very shortly after the initial advance of Company G. The gap intentionally created between Companies E and G affords a position area from which supporting fires can be delivered for a considerably longer period of time against Woods R. The platoon delivering the fire against Woods R will be closer to and can more readily displace in support of the attack of Company G, when its fires are masked. His rejection of the recommendations that the fires of both platoons be placed on Position V is based upon the fact that he realizes that some fire support must be provided to the attack of Company G if he expects it to be successful. The advance of Company E from its line of departure in the streambed northwest of RJ 528-L, will soon mask the fire of the caliber .30 machine gun platoon located 100 yards northeast of RJ 528-L; therefore, he orders that the fires of this platoon be shifted, when masked, to the eastern edge of Woods R, insuring the profitable employment of his caliber .30 machine guns within the opportunities available. The range from this position to the eastern edge of Woods R permits overhead fire by this platoon.

(2) He rejects the recommendations of Captain Company H for the employment of the 81-mm mortar platoon for the following reasons:

The position area recommended for this platoon does not afford defilade from small-arms fire. It does afford some concealment from the air. Even if this area did afford defilade from small-arms fire, it is too restricted to accommodate the number of weapons in a mortar platoon. He rejects the recommendations as to its fire missions, because of his plan to use a part of this platoon to smoke an area in the eastern edge of Woods R. The foregoing illustrates the principle that decisions as to the tactical employment of the heavy weapons company are the responsibility of the battalion commander, and that the relationship of the heavy

weapons company commander to the battalion commander is that of an adviser and an assistant. Therefore, the battalion commander must know the capabilities and limitations of these weapons as well as the tactical principles involved in their employment.

b. Lieutenant Colonel 2d Battalion approves, in part only, the recommendations of Lieutenant Antitank Platoon. The recommendations for the employment of one section on Hill 522, are disapproved for reasons as follows:

(1) The mission of these weapons in the attack is the close protection of the front and the flanks of the attacking echelon. Since Hill 522 is approximately 1000 yards from the line of departure, which is the maximum effective range of these weapons, it is obvious that close protection cannot be provided to the attacking echelon, initially from that position; and that after any advance the attacking echelon would be beyond effective range. The recommendation for the cover position to be occupied by the other section and its fire missions are approved; since from this position, close protection can be provided to the attacking echelon against the most likely avenue of hostile tank attacks until the troops reach the edge of Woods R. This illustrates the principle that the battalion commander is responsible for the tactical employment of the antitank platoon and that the platoon leader is only an adviser to the battalion commander.

c. The recommendations of Lieutenant Cannon Platoon are approved. This platoon, from cover positions recommended, can accomplish its primary mission in the attack; namely, the immediate destruction by direct fire of definitely located targets which cannot be destroyed promptly nor neutralized by organic supporting weapons, and the destruction of which involves unnecessary delay or a heavy expenditure of ammunition by the supporting artillery.

d. The recommendations of Lieutenant Chemical Platoon are approved. The chemical platoon is equipped with four chemical mortars for smoke operations, and the weapon has a range of 2400 yards. (The capabilities of this platoon

in establishing and maintaining a smoke screen were stated in the exercise.)

The principal mission of chemical troops in the initial phases of an attack is to fire smoke to screen the advance of attacking infantry across open terrain. The fire-power of modern automatic weapons is so great that it is almost impossible for infantry to advance across open terrain and close with an enemy in position without prohibitive losses unless the attacker is prepared to accomplish one of the following:

(1) To place sufficient artillery and mortar fire on the enemy position to disrupt his plan of defensive fires;

(2) To blind the enemy with smoke so that he will be unable to deliver aimed fire on our advancing troops;

(3) To place a combination of both on the enemy.

It takes a great deal of fire to drive an enemy out of an organized position or to seriously disrupt his plan of defensive fires; it will frequently take more fire than is available. Artillery and mortar fire will force the enemy to take cover; when supporting fires cease, hostile fire again becomes effective. Smoke used alone will blind hostile observation but will not neutralize the fixed fires of automatic weapons. A combination of artillery, mortar and chemical fires on the enemy position tends to disrupt his plan of fires, pin him to the ground and blind his observation to such an extent that aimed or observed fire delivered against the attacking echelon is relatively ineffective.

The enemy Position V has been definitely located. Troops attacking this position must advance across open terrain; they will be very vulnerable to aimed fire from this position. The enemy has been located in Woods R, but the enemy dispositions there have not as yet been accurately determined. It would be most desirable to employ the chemical platoon to smoke both Woods R and Position V; however, this is beyond the capabilities of the platoon. Therefore, the bulk of the platoon's smoke should be placed on the definitely located enemy position at V. In order to protect the right attacking company from flanking fire from Woods R and to

screen the advance of the left attacking company against Woods R, the remainder of the chemical platoon's smoke should be placed on the northeast edge of Woods R. The remainder of Woods R will be screened by the smoke of one section of the 81-mm mortar platoon.

The smoke screen should be initiated two minutes before H-hour to give the platoon time to register and establish the screen before the infantry crosses the line of departure.

The open area south of R. Floyd and Woods Q offers a threat to the attacking companies after their capture of Position V and Woods R, particularly the right attacking company, thus the chemical platoon should be prepared upon completion of its smoke missions on Position V and Woods R to place smoke on Woods Q and the open ground south of R. Floyd.

SITUATION, CONTINUED

MAP: Map D, Figure 46.

Lieutenant Colonel 2d Battalion completed his plans for the attack, obtained the sketches (Map D, Figure 46) from Staff Sergeant (operations), and at 5:00 PM assembled Captain S-3, Lieutenant S-2, Lieutenant S-4, the company commanders, the Artillery Liaison Officer, Lieutenant 2d Platoon, Company A, 901st Chemical Regiment, Lieutenant Battalion Transport Officer, Lieutenant Communication Officer, Lieutenant Antitank Officer, Lieutenant Cannon Platoon, and Captain Battalion Surgeon on the reverse slope of the small hill at (43.3-42.6) and issued the following oral order for the attack:

> "Here is an operation sketch for each rifle company commander, the heavy weapons company commander, Lieutenant Communication Officer, Lieutenant Antitank Platoon, and Lieutenant Battalion Transport Officer. Other officers, place yourselves where you can see one of the copies. Follow the sketch and make notes.
>
> "You have all been oriented. Are there any questions on the hostile situation, disposition of our covering forces, regimental plan of attack, battalion objectives and zone of advance, time of attack, line of departure, and units on the right and left?

"Beginning at 5:50 AM, artillery in support of our battalion fires on the hostile position at V; at 5:55 AM, these fires will be shifted to the eastern edge of Woods R; at 6:00 AM, fires will be shifted back to Position V and will remain on that position until signal to lift by Captain Company E (right company). Artillery forward observers will accompany Captains E and G (left company).

"The 75-mm (How) platoon, from a cover position in the vicinity of the northwestern edge of Woods S, will be prepared to assist the advance of both attacking companies, by fire on targets of opportunity. It will pay particular attention to Company E.

"This battalion, with 2d Platoon, Company A, 901st Chemical Regiment, attached, will pass through the covering force, capture Hill 722-b, and continue the attack toward Hill 747.

"Direction of attack: 320 degrees, magnetic.

"Formation: Companies E and G, from right to left.

"Company E, with its right on the right boundary, will attack on a front of 400 yards, capture Position V, prepared to continue its attack toward RJ 643-D.

"Company G, with its left on the battalion left boundary, will attack on a front of 600 yards, capture Woods R and Hill 722-b, prepared to continue its attack toward farmhouse at (42.2-44.0).

"Company F, in battalion reserve, will await orders at Clear Spring Stock Farm. It will maintain contact with the 1st Battalion, on the right, and the 2d Division, on the left, employing a maximum of one-half squad on each flank. Route of reconnaissance towards O. Grisham, house on stream at (42.15-43.35) and via Woods S, thence along battalion left boundary.

"Company H will support the attack as follows:

"One caliber .30 machine-gun platoon, from a position area about 100 yards northeast of RJ 528-L, will fire on Position V. It will be prepared, when its fire is masked, to fire on the eastern edge of Woods R.

"One caliber .30 platoon, from a position area between RJ 545-L and RJ 530-F, will fire on the eastern edge of Woods R. It will be prepared, on order, to support Company G.

"The 81-mm mortar platoon (less one section), from a position area in the draw 150 yards northeast of Clear Spring Stock Farm, will, beginning at H-5, fire

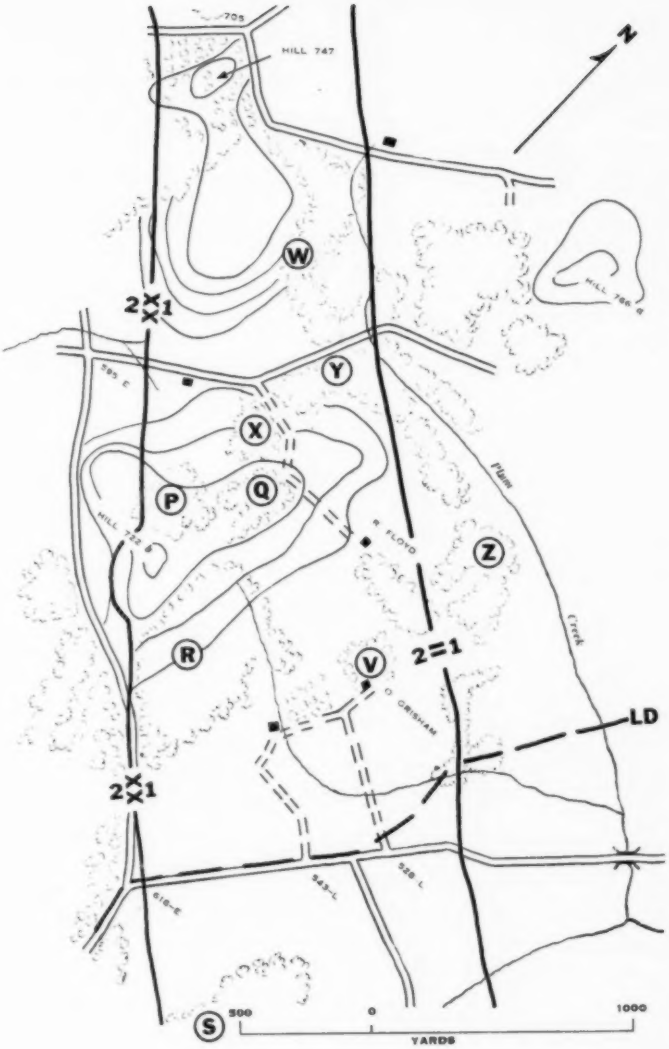


FIGURE 46.—Map D.

on definitely located targets on Position V. It will be prepared to shift its fires to targets in the eastern edge of Woods R, on order.

"One section of the 81-mm mortar platoon, from a position area in the wooded draw 400 yards southwest of the Clear Spring Stock Farm, will, beginning at H-2, smoke the eastern edge of Woods R from the battalion left boundary to a point 300 yards north thereof.

"One section, 37-mm antitank platoon, from a cover position in the woods 200 yards east of RJ 528-L, will protect against mechanized attacks from the direction of Positions V and Z.

"The other section of this platoon, from cover position in woods about 450 yards east of CR 618-E, will protect against mechanized attacks from the direction of Woods R and PositionV.

"The 2d Platoon, Company A, 901st Chemical Regiment, from positions near Clear Spring Stock Farm, will screen with smoke the hostile front line at Position V and along the northeastern edge of Woods R, beginning at the point where the stream leaves the woods, extending 300 yards to the south, beginning at H-2. It will then be prepared to screen, on order, the line: point at (41.8-44.3)—point at (41.6-43.6).

"Signal for lifting fires of artillery, chemical mortars and 81-mm mortars engaged on smoke missions—white star parachute.

"Battalion command post: in those woods, (pointing to Woods S), about 400 yards west of here.

"Company command posts: to be reported.

"Are there any questions?

"It is now 5:10 PM."

FIFTH REQUIREMENT

1. As Lieutenant Colonel 2d Battalion, what instructions, if any, do you issue relative to the following:

a. Antiaircraft and antitank protection of the battalion assembly area between dark (6:45 PM) tonight and the time of attack (6:05 AM tomorrow)?

b. Movement from the assembly area to attack positions, i.e., will the selection of routes and the choice of time for initiating the movement be decentralized to company commanders, or will this be regulated wholly, or in part, by you?

2. What matters do you discuss with Lieutenant Colonel 1st Battalion when you meet him at 5: 30 PM?

A SOLUTION OF FIFTH REQUIREMENT

1. Prior to the departure of the company commanders from the hill 150 yards west of RJ 515-G, Lieutenant Colonel 2d Battalion issues the following instructions:

a. The 37-mm antitank guns, on antitank missions, will be left in firing positions, covering the roads after dark until it is deemed necessary to remove them preparatory to movement forward to attack position.

The air guards and caliber .30 machine guns assigned to antiaircraft missions will be removed shortly after dark.

b. Movement from the battalion assembly area to attack positions will be made as follows:

Company H and Antitank Platoon (under control of Captain Company H), will clear RJ 528-E, (44-40), by 3:30 AM and proceed to position areas under control of Captain Company H. The Antitank Platoon to be relieved from control of Company H when the column formation is broken up to permit elements to move to firing positions.

Rifle companies, in the order E, G, and F will march under battalion control to G. Cary, (43-43), commencing at 3:35 AM; movement from G. Cary to attack positions will be under company control.

2. During his conference with Lieutenant Colonel 1st Battalion, Lieutenant Colonel 2d Battalion:

a. States briefly his plan of attack and secures a brief summary of the plan of attack of the 1st Battalion.

b. Agrees on the details of maintaining contact between the two battalions.

c. Reaches an agreement that the artillery concentration on the southern part of Woods Z might be called for by the 2d Battalion if necessary, but that the approval of the Commanding Officer 1st Battalion would be secured in each case in order to safeguard the left elements of the 1st Battalion.

DISCUSSION OF FIFTH REQUIREMENT

1. *a.* Security of the battalion is a continuous responsibility of the commander. Lieutenant Colonel 2d Battalion realizes that hostile mechanized elements can operate at night. Due to limited visibility and a lack of definitely marked routes, movements will ordinarily be confined to roads; therefore, he directs that the 37-mm antitank guns be disposed so as to cover the roads entering the battalion assembly area. It is the responsibility of every commander to conserve to the maximum the energy of his men during combat, in order that they may be at the peak of their physical capabilities. Lieutenant Colonel 2d Battalion realizes that caliber .30 machine guns are not effective at night without searchlights, against hostile air attacks. Therefore, he directs the relief of the caliber .30 machine gun elements assigned to antiaircraft missions when they can no longer effectively accomplish this mission.

b. In this situation, the presence of a covering force permits the occupation of previously selected positions by elements of Company H and the Antitank Platoon without the protection of rifle elements of the battalion. Since it requires more time for the occupation of firing positions and the issuance of fire orders to elements of these units than is required by rifle elements in moving from the line or area of departure to the attack, Lieutenant Colonel 2d Battalion directs Company H and the Antitank Platoon to precede the rifle companies from the battalion assembly position. Wherever possible, secrecy should obtain. If the companies and the Antitank Platoon are permitted to move from the assembly area to their attack positions, although on a time schedule under company control, some confusion may arise which may defeat secrecy. The fact that the route for all elements from the assembly area to G. Cary will be the one available road, facilitates the movement of the battalion to that point in two echelons. The leading echelon is to consist of Company H and the Antitank Platoon, under the command of Captain Company H, with the rear echelon consisting of the three rifle companies under the command of

the battalion commander until G. Cary is reached. At this point, rifle companies are released to company control, because the initial attack locations of these companies necessitate movement from this point forward by divergent routes. Thus, the battalion commander has provided for secrecy and control.

2. The exchange of plans between commanders of adjacent units (1st and 2d Battalions) will insure mutual assistance and unity of effort.

SITUATION, CONTINUED

1. The 2d Battalion attacked at 6:05 AM. Company E, initially, made rapid progress under cover of the smoke screen on Position V. However, the chemical mortars were forced to cease firing when the leading elements of this company arrived within 200 yards of the hostile position and an east wind rapidly dissipated the smoke screen. At the same time, hostile machine guns concealed in the south edge of Woods Z opened fire across the right front of Company E. The advance of Company E was therefore stopped about 150 yards in front of Position V.

2. The 1st Battalion was able to capture the southern and eastern edges of Woods Z by 7:30 AM, and later, to assist the advance of the 2d Battalion. With this assistance, the attack of Company E was successful and by 8:30 AM, it had captured Position V and the woods 300 yards northwest of V. Its leading elements are receiving heavy fire from a hostile position on the ridge about 200 yards west of R. Floyd.

3. Due to heavy rifle and machine gun fire from the eastern edge of Woods R, Company G was able to advance only about 150 yards northwest of the road: RJ 545-L—CR 618-E. At 8:30 AM, it had committed the support platoon and was still unable to advance.

4. Company H is disposed as follows:

a. The 1st Platoon (less 2d Section) is displacing to a position area in the southwest edge of woods just east of R. Floyd, with the mission of engaging hostile positions on the ridge about 200 yards west of R. Floyd. The 2d

Section is occupying its initial position area and upon the completion of the displacement of the 1st echelon of the platoon, will displace to the same area, with the same mission.

b. The 2d Platoon, from position area between RJ 545-L and RJ 530-F, is firing on the eastern edge of Woods R.

c. The 81-mm Mortar Platoon (less one section), from a position area in the draw 150 yards northeast of Clear Spring Stock Farm, is firing on definitely located targets in the northeastern edge of Woods R. One section, from a position area in the wooded draw 400 yards southwest of Clear Spring Stock Farm, is firing on definitely located targets in the southeastern edge of Woods R.

5. The 37-mm Antitank Platoon is disposed as follows:

a. The 1st Section is in a cover position in the woods east of R. Floyd, to protect against mechanized attacks from the west and north.

b. The 2d Section is in a cover position in the woods 450 yards southeast of CR 618-E, to protect against mechanized attacks from the direction of Woods R and Position V.

6. Company F is at its initial reserve location.

7. The 2d Platoon, Company A, 901st Chemical Regiment, is in position near Clear Spring Stock Farm and has ceased firing due to the expenditure of all available ammunition.

8. The artillery is firing on the hostile positions in the eastern edge of Woods R.

9. The Cannon Platoon, having fired on several targets of opportunity, from positions in the southwest edge of Woods S, is now in a cover position in the draw about 150 yards southwest of Clear Spring Stock Farm, with observers near the house, 200 yards southeast of RJ 530-F, prepared to fire on targets of opportunity along the eastern edge of Woods R.

10. At 8:30 AM, Lieutenant Colonel 2d Battalion is observing the action from a position near RJ 545-L: nearby are Captain S-3, Captain Company H, Captain Company F, Captain Artillery Liaison Officer, Lieutenant Cannon Platoon, Messengers One and Two. Lieutenant Colonel 2d Battalion is aware of the situation of his own battalion and

has the following information of units on his right and left:

a. The 1st Battalion is reorganizing in Woods Z, preparatory to continuing the attack in the direction of Hill 766-a.

b. The right battalion of the 2d Division, initially, made its main attack in the vicinity of Middle Creek, on its south flank. This battalion is now attacking generally north toward Hill 722-b with its right flank in the woods about 200 yards north of P. Odle (41-42).

11. The command post, located in the northeastern edge of Woods S, is connected to the observation post by telephone. Major Executive Officer is at the command post and has just reported that he has advised the regimental commander of the situation. Lieutenant S-2 is engaged in intelligence activities.

12. Hostile dispositions in Woods R have not been completely located. Heavy fire from the northern and eastern edges of these woods discloses the presence of riflemen and machine guns located a short distance within the woods.

13. At 8:30 AM, the following telephone message from the regimental commander is received.

"The regiment will resume the attack at 9:15 AM.

"The 1st Battalion will continue its attack toward the northwest and capture Hill 766-a.

"Resume your attack at 9:15 AM to capture Hill 747. The 2d Division has been notified of the attack.

"Are there any questions?"

SIXTH REQUIREMENT

Actions taken and orders actually issued by Lieutenant Colonel 2d Battalion, between the time of receipt of the regimental order and 9:15 AM to continue the attack of his battalion.

A SOLUTION OF SIXTH REQUIREMENT

Actions taken and orders actually issued by Lieutenant Colonel 2d Battalion:

1. In the presence of the Artillery Liaison Officer, Lieutenant Cannon Platoon, Captain S-3, Captain Company H,

and Captain Company F, telephones Major Executive Officer and issues the following oral order:

"We will resume the attack at 9:15 AM, capture Woods R, Hill 722-b, and Hill 747.

"The artillery fires on the eastern edge of Woods R until lifted by signal from Company G. It will then shift to hostile position 200 yards west of R. Floyd and lift from there on signal from Company E.

"The 2d Platoon, Cannon Company will fire on targets of opportunity in the eastern edge of Woods R until its fire is masked; it will then be prepared to fire on suitable targets on the hostile position 200 yards west of R. Floyd.

"Company G, will attack, capture Woods R, Hill 722-b, and Woods P.

"Company H will support the attack of Company G.

"Company E will, initially, support the attack of Company G by fire, prepared to attack and capture the hostile position 200 yards west of R. Floyd, and the eastern edge of Woods Q on order. It will protect the right flank of the battalion.

"Company F, in battalion reserve, will move to wooded area 450 yards east of O. Grisham. Contact missions, no change.

"The chemical platoon, depending upon resupply of ammunition, will screen the eastern edge of Woods R with smoke from 9:13 until the signal to lift artillery fire is given by Company G, when it will be prepared to place smoke on the line: (41.8-44.3)—(41.6-43.6) on order.

"You transmit the order to the chemical platoon. I will notify the others.

"Are there any questions?

"It is now 8:40 AM."

2. Tells the Artillery Liaison Officer:

"You know the plan.

"I want the artillery to fire on the eastern edge of those woods (pointing to R), until 9:15 AM and then follow the plan of fire I've outlined.

"Any questions?"

3. Directs Captain Company H:

"You know the plan.

"The 1st Platoon, from its present position area, will place its fire on the northern and eastern edges of Woods R, until masked by the advance of Company G, thereafter will fire on hostile position west of R. Floyd.

"The 2d Platoon will support the attack of Company G from present position areas until its fire is masked and thereafter will closely support the attack of Company G, within its zone of action.

"The mortars, from present position areas will fire on definitely located targets in the edge of Woods R.

4. Directs Captain S-3:

"S-3, you are familiar with the plans for resuming the attack.

"Notify Lieutenant Antitank Platoon to have his platoon remain on present mission.

"Inform Captain Company E, in the woods east of R Floyd, of all the details for the attack.

"Any questions?"

5. Directs Captain Company F:

"You and messenger Two remain at the OP.

"I'm going to Company G (pointing) and give them the orders for the attack.

"I'll return here by 9:15."

6. Lieutenant Colonel 2d Battalion, accompanied by Messenger One, moves to the southwest and keeping under the cover of the ridge near the road, proceeds to the command post of Company G, joins the company commander at a point about 300 yards east of CR 618-E, and gives him the following oral order:

"We resume the attack at 9:15 AM.

"The artillery will fire on the eastern edge of those woods (pointing to Woods R). The chemical platoon, depending on timely resupply of ammunition, will screen those woods, commencing at 9:13. Both will lift on white star parachute signal from you.

"The cannon platoon will fire on targets of opportunity, along the eastern edge of Woods R, until its fires are masked by your advance.

"Resume your attack from present positions at 9:15, capture the eastern part of those woods (pointing to R), Hill 722-b, and Woods P. Company E, from its present position at V, will initially support your attack by fire, prepared to attack the hostile position 200 yards west of R. Floyd and the eastern edge of Woods Q, on order.

"1st Platoon, Company H, from positions in woods southeast of R. Floyd, will place its fire on the north and eastern edge of Woods R, until its fire is masked by your advance.

"2d Platoon, Company H, will support your attack from its present position until its fire is masked and thereafter will closely support the attack of your company.

"3d Platoon, Company H, will place its fire on the eastern edge of Woods R, until its fire is masked by your advance.

"Are there any questions?

"It is now 9:00 AM."

DISCUSSION OF SIXTH REQUIREMENT

Lieutenant Colonel 2d Battalion should accomplish the following major tasks between 8:30 AM and 9:15 AM:

1. Revise his plan of attack to meet the conditions now confronting his battalion, including plans of maneuver and of fire support.

2. Transmit his attack order to all units at such time as will insure a coordinated attack at 9:15 AM.

In revising his plan, he considers the following possibilities for continuing the attack: (1) to follow his initial plan for the employment of his rifle companies, adjusting his fire support to favor the attack of Company E; (2) to continue with the same companies in the attacking echelon, Company E to assist by fire the attack of Company G against Woods R, and upon the capture of Woods R by Company G, to continue the attack in its own zone of action; to initially shift all fires to the support of Company G; Company G, upon the capture of the eastern edge of Woods R, to continue the attack in its zone of action; and (3) to

attack with three companies in the attacking echelon by having Company F attack in the gap between Companies E and G.

Plan (1). A continuation of the attack under the initial plan may permit the advance of Company E on the right; but at the same time, Company G, which has been held up after only a short advance from the line of departure, would be unable to advance its attack, without additional supporting fires. This action would probably result in a gap of about 1400 yards between Companies E and G (assuming that the former reached the vicinity of RJ 643-D), which cannot be protected by the reserve company. Such a separation of elements of the battalion would result in a loss of control and coordination by the battalion commander. In addition, during the advance of Company E, some elements of that company would doubtless be subjected to flanking fire from the northern edge of Woods R.

Plan (2). Assisted by Company E and the fires of all supporting weapons, Company G should be able to capture Woods R and continue the attack in its zone of action. Some supporting fires, after the capture of Woods R, should be shifted to support a resumption of the attack of Company E in its zone of action. This plan, if successful, will accomplish the initial plan of the battalion, with minimum losses, with the added advantage of maintaining an adequate battalion reserve for use under more favorable conditions than now exist.

Plan (3). A resumption of the attack under this plan would probably insure an initial advance. However, the attack of elements of Company F to the northeast of RJ 550-L would tend to mask the fires of a portion of Company E and the heavy machine gun platoon supporting that company. An attack by Company F launched to the southwest of the road RJ 530-F—RJ 550-L would mask the fire of the heavy machine gun platoon, located between RJ 530-F and RJ 545-L, and the fire of the right elements of Company G. The gap existing between Companies E and G will not permit the maneuver of Company F. Thus, the attack of Company F would be a frontal attack against Woods R. The

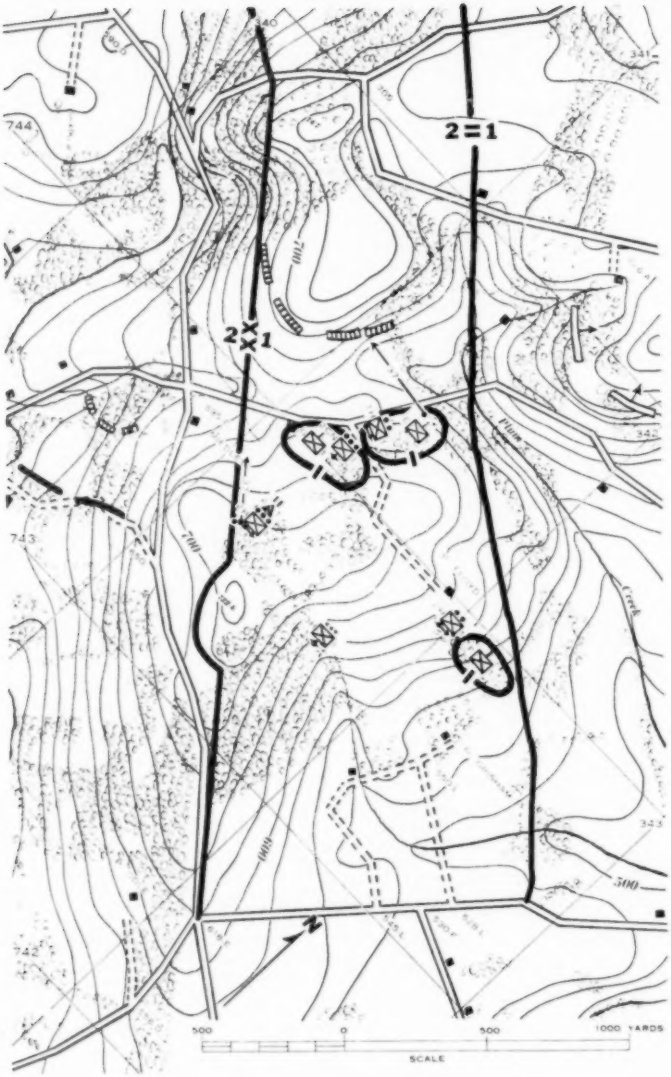


FIGURE 47.—Map E.

situation does not appear to justify the use of the battalion reserve.

The battalion commander, after a consideration of the plans mentioned above, decides to adopt Plan 2 for the resumption of the attack.

SITUATION, CONTINUED

MAP: Map E, Figure 47.

1. The battalion resumed the attack at 9:15 AM. Supported by the fires of the artillery, the cannon company, the heavy weapons company, (the chemical platoon had not received a resupply of smoke ammunition at the hour of attack), and Company E, Company G captured the hostile position in the eastern edge of Woods R and continued its attack towards Hill 722-b. Hostile resistance in the woods made progress slow and costly.

2. Company E, supported by the fires of the artillery, the cannon platoon, and of the heavy weapons company (less one platoon) attacked the hostile position 200 yards west of R. Floyd.

3. By 11:30 AM, Company E had captured the hostile position 200 yards west of R. Floyd and the eastern edge of Woods Q, where it stopped to reorganize; Company G had captured Hill 722-b, Woods P, and the western portion of Woods Q; Company F had advanced to a new reserve location in the woods east of R. Floyd. The 2d Battalion reorganized and continued the attack to the northwest to capture Hill 747.

4. At 12:30 PM, Lieutenant Colonel 2d Battalion, Messengers One and Two are in an observation post in the north edge of Woods P. Nearby are Captain Artillery Liaison Officer, Captain S-3, Captain Company H, Captain Company F, and Lieutenant Cannon Platoon. The observation post is connected to the command post, which is located in the east edge of Woods Q, by telephone. The battalion commander is aware of the situation as follows: (Map E, Figure 47).

a. Fire from a hostile position which extends from woods at (40.5-44.4) around the nose in the clearing on the southeastern slopes of Hill 747 to a point at (41.1-44.5) has stopped the advance of Companies E and G. Company E is located in the northwestern part of Woods Y, along the road running northeast from RJ 643-D with all platoons committed. Company G is in the area: Woods X—house at (41.1-44.0) with one platoon in support.

b. Company F, in reserve, is in the woods just east of R. Floyd.

c. Company H is disposed as follows:

The 2d Platoon is firing on the eastern part of the hostile position on Hill 747 from positions in the western edge of Woods P.

The 1st Platoon (less 2d Section) is moving into a position area in the northwestern edge of Woods Y, with the mission of covering by fire the western part of the enemy position on Hill 747. The 2d Section is still in its position area in the woods just east of R. Floyd, protecting against hostile counterattack during the displacement of the 1st echelon of the platoon.

The 81-mm Mortar Platoon has completed displacement to a position area at the head of the draw running southeast from Hill 722-b with the mission of firing on located automatic weapons and entrenched riflemen on Hill 747.

d. The 37-mm Antitank Platoon is disposed as follows:

One section is in a cover position in the western edge of Woods P, to protect against hostile mechanized attacks from the northwest and west. The other section is in a cover position in the western edge of Woods Y about 250 yards northeast of RJ 643-D, to protect against attacks from the northeast and west.

e. The 2d Platoon, Cannon Company has displaced to a cover position in the western edge of Woods X and is prepared to fire on targets of opportunity on the hostile position along the southeastern slope of Hill 747.

f. The 1st Battalion, on the right, is attacking Hill 766-a from the south and southwest. Leading units of this battalion are in the woods on the southern and southwestern slopes of that hill.

g. The right battalion of the 2d Division is now located generally along the road: RJ 650—CR 510-D, where it was stopped by the fire of a hostile position in the woods about 300 yards north of that road.

5. The 2d Platoon, Company A, 901st Chemical Regiment has been relieved from attachment to the 2d Battalion.

SEVENTH REQUIREMENT

Actions taken and orders actually issued by Lieutenant Colonel 2d Battalion to continue the attack of his battalion.

A SOLUTION OF SEVENTH REQUIREMENT

MAP: Map E, Figure 47.

Actions taken and orders actually issued by Lieutenant Colonel 2d Battalion:

1. Communicates by telephone with the command post of the 1st Infantry and requests permission to move the reserve company through the cover along Plum Creek to attack Hill 747.

2. In the presence of Captain S-3, Captain Company H, Captain Company F, Lieutenant Cannon Platoon; addresses Captain Artillery Liaison Officer.

"You are familiar with the situation. I am going to envelop the hostile left by advancing Company F up Plum Creek with the mission of attacking through Woods W to capture Hill 747. Captain Company F will fire an amber star cluster from the vicinity of the stream crossing at point (41.4-44.6), (pointing on map), when its attack is launched.

"In the meantime, I want you to continue your artillery fires on the hostile position, concentrating the mass on that part of the hostile position in front of Company E and in Woods W; your fires to lift to Hill 747 on white start parachute fired by Captain Company F, or on call, and to lift

therefrom on similar signal. Can you do this and can you furnish an artillery observer to accompany Company F?"

Captain Artillery Liaison Officer: "Yes, sir."

Lieutenant Colonel 2d Battalion: "O. K."

3. To the assembled group:

"Are there any questions on artillery support, battalion objective, and time of attack?

"The 2d Platoon, Cannon Company will support our attack with particular attention to targets in the eastern half of the hostile position.

"Company E will attack, capture the hostile position within its zone; support the attack of Company F by fire until its fire is masked and then assemble in Woods W, prepared to resume its advance in the zone: RJ 705—Battalion right boundary, on orders.

"Company G (less one rifle platoon) will attack, capture hostile position within its zone; support the attack of Company F by fire until its fire is masked and then assemble in woods 350 yards southeast of the crest of Hill 747 and await orders.

"Company F moving through Woods Z and along Plum Creek to a point where road crosses stream (pointing on sketch) (41.4-44.6) will attack through Woods W, enveloping the hostile left flank and capture Hill 747, prepared to continue its attack to the northwest, on order. An artillery observer will accompany Captain Company F. One SCR 195 radio, with operator, will also be furnished to Captain Company F. Radio report of the launching of the attack will be made confirming the amber star cluster signal.

"Company H will support the attack as follows:

"2d Platoon, from present positions, will fire on the eastern part of the hostile position (pointing). 1st Platoon (less 1st Section) will support Company F. The 1st Section from present position will fire on the western part of the hostile position.

"The 81-mm mortar platoon from present position will fire on definitely located automatic weapons and entrenched riflemen with particular attention to that part of the hostile position in front of Company E.

"One rifle platoon, Company G, will take position in woods at (41.7-44.5), as battalion reserve, prepared to follow Company F on order.

"Any questions?

"Get under way, time is short."

4. To Captain S-3:

"Notify Companies E, G and the antitank platoon of the plan for the attack. Tell Lieutenant Antitank Platoon that upon capture of Hill 747, he will occupy positions thereon from which he can protect against mechanized attacks from the north and from the northwest.

"Any questions?

"Move fast. I want all to have maximum time for preparation.

"I will notify the Battalion Executive."

5. By telephone to the command post, informs Major Executive Officer of his plans for resuming the attack and directs him to notify members of staff concerned and to advise regiment.

DISCUSSION OF SEVENTH REQUIREMENT

The plan of Lieutenant Colonel 2d Battalion, as announced in the Solution of the 7th Requirement, conforms to the tactical principle of the timely employment of the battalion reserve in a decisive direction when, by so doing, it is reasonable to expect results which will insure accomplishment of the attack mission; namely, the capture of Hill 747. This maintains the continuity of the attack. Lieutenant Colonel 2d Battalion realizes that the position of the right battalion of the 2d Division, on his left, prohibits the employment of his reserve by maneuver in that zone of action, while the attack of the 1st Battalion, 29th Infantry, has uncovered a wooded route of approach which facilitates the maneuver of his reserve.

The attack missions assigned Companies E and G (less one platoon) illustrate the principle of flexibility; by now using these companies in the secondary attack, the battalion commander thus fixes the hostile elements and their local supports which are holding up the battalion.

The announced plan of fires illustrates the principle of placing the bulk of supporting fires on located hostile positions or on critical terrain features in the zone of action of elements making the secondary attack, when these terrain or hostile positions will interfere by fire with the elements making the main attack.

The fire missions assigned to organic and supporting weapons provide for the destruction or neutralization of hostile positions which may interfere, not only with the attack of Companies E and G, but with the attack of Company F, when it emerges from Woods W. The caliber .30 machine gun section, directed to support the attack of Company F, is to provide close fire support for that company on targets which may appear in its zone of action and which cannot be reached by other supporting weapons.

By the designation of the support platoon of Company G as the battalion reserve, the battalion commander conforms to the principle of maintaining a reserve, however small, whenever possible. The location to which this reserve is to be ordered conforms to the principle of locating reserves with a view to extending the action of the unit making the main attack. Whenever the unit designated initially as battalion reserve has been committed, he takes timely steps to reconstitute a new reserve of sufficient strength to be capable of accomplishing the probable missions to which it may be assigned. In this case, he plans to use Company G. However, if the attack of Company F progresses only far enough to pinch out Company E, he can quickly issue instructions which will cause Companies G and F to continue the attack, leaving Company E, which is to reorganize in Woods W, as his reserve.

The selection of the route assigned to Company F, conforms to the principle that the reserve is moved, whenever practicable, via a route which affords cover and concealment at least as far forward as the line or area of departure.

CHAPTER 5

Engineers in a River Crossing

With the possible exception of installing barriers on a large scale to protect against mechanized attack, no tactical operation offers engineers so great an opportunity to assist infantry as a river crossing in the face of the enemy. Likewise, no tactical operation requires such close coordination of effort.

From a tactical standpoint, the operation usually begins with a surprise crossing of a comparatively small force on a wide front, under cover of darkness or smoke. The initial wave is usually ferried over in assault boats. When the far bank, or at least some portions of it, has been cleared of enemy forces, footbridges may be constructed. By means of these and boat ferries sufficient troops may then cross and seize a bridgehead* to cover the crossing of the main body.

Engineers are required to perform various duties in connection with a river crossing. They reconnoiter the stream to determine suitable sites for ferrying and for foot and ponton bridges; they bring up material for the crossing and conceal it until needed; they operate the ferries and construct the bridges and approaches; they maintain and guard these bridges, and mark routes of approach to them.

Each triangular infantry division includes an engineer combat battalion. In addition, other engineer units may be attached to the division from the corps, army, or GHQ. The term "divisional engineers" includes not only the divisional engineer combat battalion, but also any engineer

*A position occupied by advance troops to protect the passage of a river or defile by the remainder of the command.

units which may be attached, temporarily, to the division in order to meet the engineering needs of a particular situation. For example, one or more platoons from a light ponton company may be attached to a division for a river crossing; or, if an unusual amount of road maintenance is involved, a company or more from one of the engineer combat regiments of the corps may be attached.

Table I lists the various types of engineer units which may be available to assist an infantry division in a river crossing, and the type and quantity of equipment furnished by each of these engineer units. One unit of footbridge equipage provides approximately 432 feet of footbridge. The corps combat regiment furnishes one unit; the light ponton company furnishes three units. One unit of ponton bridge equipage provides approximately 250 feet of ponton bridge. The light ponton company furnishes three units; the heavy ponton battalion furnishes four units.

The engineer combat battalion of the triangular infantry division (18 officers—616 enlisted men) is a motorized unit. It consists of a battalion headquarters and headquarters company, and three companies of engineers. It is the only type of engineer unit permanently assigned to a triangular infantry division. Ten assault boats constitute the only river crossing equipment provided in the combat battalion; these boats are nested to facilitate their transportation in one 1½-ton truck. Engineers from this unit perform all types of engineer work within the triangular infantry division. In a river crossing it will usually be necessary to reinforce them with engineers from higher echelons.

In each army corps there are two combat regiments; both are motorized. Each regiment (39 officers—1228 enlisted men) consists of a regimental headquarters, a headquarters and service company, and two battalions of engineers. Thirty assault boats and one unit of footbridge equipage are transported by the combat regiment in seven 1½-ton trucks. The assault boats require three trucks; the unit of footbridge equipage requires four trucks. Engineers

TABLE I

TYPES OF ENGINEER UNITS AND EQUIPMENT WHICH MAY BE AVAILABLE TO AN INFANTRY DIVISION FOR A RIVER CROSSING

Unit	*Equipment*	*Quantity of equipment per unit*
Combat battalion (triangular infantry division)	Assault boats.	10
Combat regiment (two in each corps)	Assault boats Footbridge equipage	30 1 unit (432 feet)
Light Ponton Company (several in army or GHQ reserve)	Assault boats Footbridge equipage Light ponton equipage	80 3 units (1296 feet) 36 light ponton boats and equipment
Heavy ponton battalion (in GHQ reserve)	Heavy ponton equipage	48 heavy ponton boats and equipment

FIGURE 48.

from the combat regiment perform all types of engineer duties within the area of the army corps, and assist divisional engineers when and as needed. They are trained in ferrying, and in the construction of both foot and ponton bridges. There are two methods by which these corps engineers may assist division engineers:

(1) Corps engineers may be employed to relieve divisional engineers of certain functions in a particular situation.

(2) They may be directly attached to the division. In some cases, both these methods will be employed. When attached, corps engineers automatically become divisional engineers and are under command of the division engineer.

The light ponton company (6 officers—215 enlisted men) is a motorized unit. While organically an army or GHQ reserve unit, the light ponton company is often attached to a corps or a division. It consists of a headquarters platoon and three bridge platoons. In addition to a headquarters section and a service section, the headquarters platoon has an assault boat section and a footbridge section. Eighty assault boats are transported by the assault boat section on eight 1½-ton trucks; two units of footbridge equipage (each unit sufficient for 432 feet of footbridge) are transported by the footbridge section in eight 1½-ton trucks. Each bridge platoon transports one unit of light ponton bridge equipage (each unit sufficient for approximately 250 feet of 10-ton ponton bridge) on six 4-ton, 4x4, semitrailer trucks, four 4-ton 6x6 trucks, and four 2-wheel trailers. The light ponton company has organic transportation for only about one-third of its needs; additional trucks are furnished from the army or GHQ reserve. Activities of the company are usually confined to the transportation of its equipment and the maintenance of bridges in use. Combat engineers construct the foot and ponton bridges, and operate the ferries.

The heavy ponton battalion (12 officers—462 enlisted men) is a motorized unit. As indicated in Table I, it is organically a GHQ reserve unit. The battalion consists of

a battalion headquarters, a headquarters and service company, and two heavy ponton bridge companies (two platoons in each company). Each of the four bridge platoons transports materiel for the construction of one unit of heavy ponton bridge (approximately 250 feet of 25-ton bridge) on 16 semi-trailer, 4-ton, 4x4, trucks. Sufficient organic transportation is provided for the needs of the battalion. Activities of the battalion are usually confined to the transportation of its equipment and the maintenance of bridges in use.

The assault boat is of the flat bottom skiff type. It is about 13 feet long, 5 feet in beam, and weighs 200 pounds. The skin is of fir plywood ½-inch thick; the ribs, gunwales, skids, and slot flooring are oak. Seven ordinary canoe paddles are provided for propelling the boat when fully loaded. Two men can paddle it when empty. It is provided with a carrying rail to assist the men in carrying it. Ordinarily, a crew of two engineers will be provided with each boat, one paddling in the stern in order to steer the boat, and the other in the bow as stroke. These two engineers and five of the infantry passengers paddle when the boat is fully loaded; the two engineers can return the empty boat from its first trip for another load. With the men fully equipped, the assault boat will safely carry any one of the loads indicated in Table II. The capacity loads listed are exclusive of two engineers who assist in paddling the boat and who remain with the boat to take it back across the stream for additional loads.

The 37-mm antitank gun is too heavy and bulky to be transported in an assault boat. It must be ferried across on a ponton or raft or some similar type of transportation, or cross on a bridge.

A corps composed of two triangular divisions, with a light ponton company attached, will have 160 assault boats

available for a river crossing. The boats are obtained as follows:

2 combat engineer battalions	20
2 combat engineer regiments	60
1 light ponton company	80
Total	160

In moving from the forward assembly area to the river the following general rules should be observed:

(1) Passengers and crew assigned to a boat should carry the boat in a continuous forward movement by the most direct route (previously reconnoitered) from the forward assembly area to the water.

(2) All boats of the initial wave should arrive at the river bank at the same time (H hour).

(3) Every precaution should be taken to prevent noise; the boat should not be allowed to strike its sides or bottom while in transit to the water; paddles should be carried by hand.

(4) Upon arrival at the river bank and before being loaded, the boat should be carried, bow first, into the water.

(5) Individual boats should be kept well separated along the front of the crossing unit. No attempt is made to main-

TABLE II

ASSAULT BOAT LOADS

No. men	*Equipment*	*Ammunition*
9	Rifles and individual equipment	136 rounds per rifleman M1 320 rounds per automatic rifle
8	1 Light machine gun	20 boxes of ammunition (5000 rounds)
8	1 Heavy machine gun	13 boxes of ammunition (3250 rounds)
7	1 81-mm mortar	50 rounds of ammunition
7	1 60-mm mortar	150 rounds of ammunition
7	Equipment of the communication section (forward echelon of a battalion headquarters)	

FIGURE 49.

tain any specific formation or line while in the water. Care should be taken to avoid hitting the sides of the boat with paddles and to avoid splashing. Any passengers not paddling should crouch low in the boat and not shift position during the crossing. There should be no firing from the boat. Upon arrival at the far bank, passengers lay their paddles in the boat, disembark, unload any extra

FIGURE 50.—Assault boat crossing in first wave.

equipment and ammunition expeditiously, and continue their missions. The engineer crew then paddles the boat back for the next load.

The time required for paddling across a river of moderate current is about one minute for a width of 100 yards and about three and one-half minutes for 300 yards. The time required to return the assault boat to the near bank, load,

and recross to the far shore will depend upon the amount of confusion in unloading at the far bank when the first wave lands, the dispersion of the boats upon their return to the near bank, and the time required to load the second wave. It will ordinarily amount to several times the actual paddling time.

The drift of the boats is a matter of importance. In a current of one mile per hour (about 30 yards per minute) a boat making three miles per hour at right angles to the current in a river 100 yards wide will drift downstream only about 35 yards. If the current is three miles per hour and the river is 300 yards wide, the drift will amount to 300 yards (the width of the river). The time of crossing is not appreciably increased by the drift downstream. If the boat is paddled diagonally upstream (at an angle of 45 degrees to the current), the drift is reduced but the time of crossing is increased. Whether to allow the drift and save time, or to reduce the drift and increase the time of crossing (with consequent increase in vulnerability if discovered) is a matter to be discussed by the tactical commanders with their unit engineers in the light of the local tactical situation. The decision rests with the tactical commander.

Table I indicates that footbridge equipage is furnished by light ponton companies and corps combat regiments. This type of equipment is transported by these units in order to avoid burdening divisional engineers with four or more trucks of equipment for which they will have only occasional calls.

The footbridge, model 1935, consists of transverse floats 10 feet long, joined by duckboard sections 12 feet long. The float is a white-pine crate, 10 feet long and 10 by 13½ inches in cross-section. The crate contains layers of expanded rubber, the displacement of which affords buoyancy to the unit. The floats and sections of duckboard weigh slightly more than 100 pounds each. Two men are usually assigned to carry either a float or a duckboard section. The floats and duckboard are assembled by means of clips into

12-foot bays* at a convenient place on the bank of the river. The sections are then joined together as they are launched, and pushed across the river. Only in exceptionally favorable situations can the bridge be assembled complete and launched as one unit, and even then for only short distances.

When the current is strong, a cable is stretched across the river just above the bridge site and part or all of the duckboard sections are fastened to the cable by mooring lines (or bridles) and rings that slide across on the cable. When the current is less than one mile per hour, guy lines from the shores may suffice to steady the bridge. Even in currents up to five miles per hour the footbridge, when erected with a cable, has sufficient stability.

In daylight, troops may cross at double time (200 yards per minute). In darkness, a marching rate of 60 yards per minute is assumed. In all cases the men are in single file with the distance between the men about two paces. If congestion occurs, so that there are four or five men on one 12-foot section, the bridge will submerge slightly but will not overturn.

During daylight, a rifle company can cross, at double time, a 300-foot bridge in three minutes; a rifle battalion can cross in about ten minutes. At night, a rifle company can cross, at a walk, in about ten minutes. A rifle battalion will require about 45 minutes. A heavy weapons company can cross, at a walk, day or night, in about 15 minutes.

With sections assembled on the bank about 50 yards from the edge of the water, 300 feet of footbridge have been thrown across the Chattahoochee River in daytime in nine minutes, including the installation of the cable. For night work in a strange locality, the rate of construction should not be estimated at more than 400 feet per hour, or a 300-foot bridge in 45 minutes. An engineer platoon can handle the assembling and the launching and joining of sections. When considerations of secrecy require that the footbridge

*A bay consists of one support and one span of a floating bridge (both footbridges and ponton bridges).

elements be carried for a considerable distance across country to reach the vicinity of the bridge site, infantry carrying parties may have to be used. Three hundred feet of footbridge require twenty-five 12-foot sections of three elements each (two floats and one duckboard). A carrying party of 150 men is necessary for its cross-country carry by hand. It is always carried on vehicles as close to the bridge site as terrain and considerations of cover and secrecy permit.

Light ponton equipage may be employed in three ways:

(1) The individual pontons may be used to transport rifle, machine-gun, and mortar units, without their trucks.

(2) Two, three, or four pontons may be assembled and decked to form a raft which will transport motor vehicles, or truck-drawn artillery, or tanks. These ferries may operate individually with outboard motors or manpower, or they may be operated as trail ferries* from cables across the stream.

(3) A ponton bridge may be built.

A light ponton, made of aluminum, is 28 feet long, 5 feet 6 inches in beam, and weighs 1,450 pounds. It will support a maximum load of 23,000 pounds. Sixteen men are required to transport it by hand. Even with this number a cross-country carry for any considerable distance is a slow and laborious undertaking. Twenty-five men can be transported in one load in addition to the engineer crew of five (four oarsmen and a coxswain); in strong currents, seven men are needed in the crew. Outboard motors will be necessary if the pontons have to be maneuvered against a current of more than 4 miles per hour. When an outboard motor is used, 35 men can be ferried at a trip in addition to an engineer crew of two.

Light pontons may be employed for ferrying troops or equipment in the early stages of the attack, and later used for the construction of a bridge. However, owing to their

*A trail ferry consists of a ponton raft fastened to a pulley on a cable stretched across a stream. The current is utilized to propel the raft, the sides of which are held at an angle of 55 degrees to the current.

being cumbersome and vulnerable to enemy fire they are used for this purpose only when such use is unavoidable.

Two pontons can be used to form a raft 10 feet wide and 21 feet long. Its normal capacity is six tons; when reinforced by an additional ponton it will carry nine tons. With

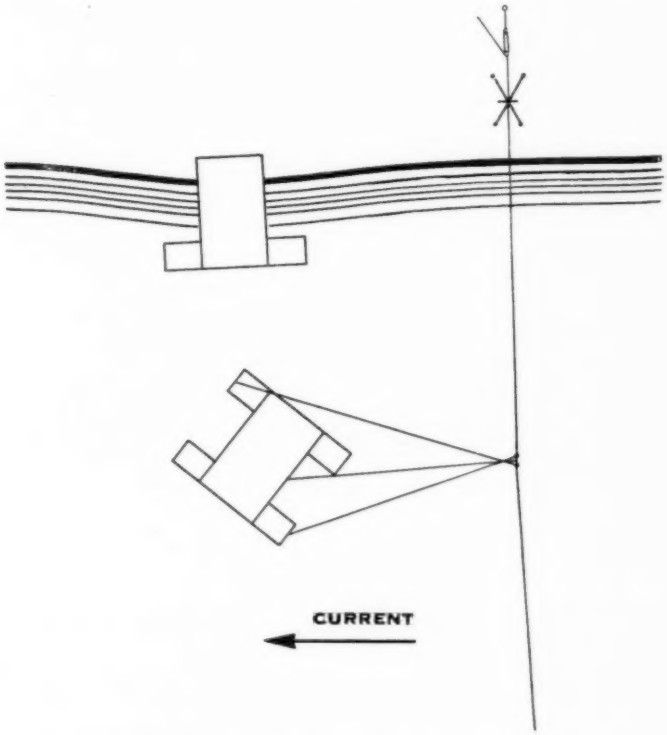


FIGURE 51.—Schematic drawing of a trail ferry.

three pontons, the length is increased to 37 feet; and with four pontons, to 53 feet. A four-ponton raft will transport either a 75-mm howitzer, self-propelled mount, or a 105-mm howitzer, self-propelled mount. Three loaded trucks with gross weight not exceeding 7½ tons each may be ferried

across on a four-ponton raft. Larger rafts are too unwieldy to handle if there is any current. Small rafts may be operated by oarsmen. The larger ones require more power, which is best applied by using an extra ponton with an outboard motor attached. Outboard motors from the light ponton company or from engineer depots can be made available if requested in time. When rafts are used, landing stages, consisting of moored pontons with ramps leading down to them from abutments on shore, are usually essential on both sides of the river.

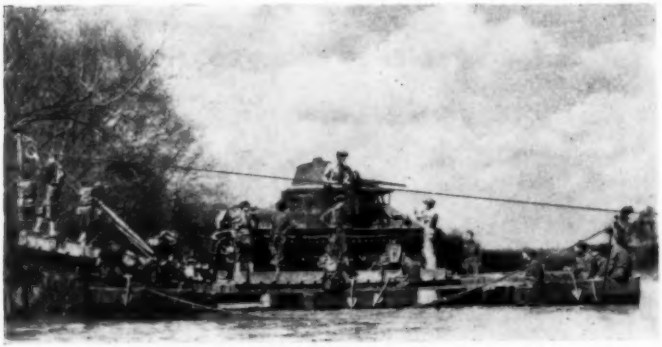


FIGURE 52.—Ponton raft preparing to move a tank across the Chattahoochee River.

The rafts may be used as free ferries, but, as a general rule, time is saved by stretching a cable or rope from bank to bank (if the width of the river allows) and operating a raft as a trail ferry by means of a pulley running on the cable. A bridle connection on the pulley permits the raft to be shifted to form an angle with the current. Thus the force of the current is utilized to aid the passage of the raft back and forth.

Under ordinary conditions, on a stream up to 600 feet wide, a trail ferry of the type described above can be put into operation in about two hours after the arrival of the ponton equipment at the ferry site. This assumes that the

far bank has been cleared of enemy forces so that the work of installing landing stages and cable can go forward simultaneously on both banks. A trail ferry with an outboard motor can make a round trip across a river 350 feet wide in about 10 minutes, including the time for loading and unloading. A free ferry propelled by an outboard motor on a river 1000 feet wide can make a round trip every twenty minutes. Since the ponton rafts are constructed primarily for the transportation of vehicles, approaches to the ferry sites and routes forward from the far bank are of great importance. Additional engineers must be provided when this work is extensive.

A unit of light ponton bridge (10-ton) equipage consists of four trestles, twelve pontons, and the floor system, plus accessories. The unit provides approximately 250 feet of light ponton bridge. Three units of light ponton equipage are assigned to each light ponton company. The present type of light ponton bridge has been designed to carry all division loads. By using extra pontons and balk*, this bridge can be reinforced to carry twenty ton loads. A continuous stream of traffic is permissible, provided there is a small interval between heavy vehicles and the speed is limited to five miles per hour.

Consideration should always be given to the amount of additional work involved in the preparation of approaches to the bridge and routes away from it on the far bank. As the enemy will undoubtedly endeavor to destroy the ponton bridges either by artillery fire or by aerial bombing, additional equipment and personnel for repairs should be kept on hand near the bridge site. In a normal situation, the equipment reserve should be sufficient to replace at least 50 per cent of the bridge.

Heavy ponton equipage has the same general use as light ponton equipage. It may be employed in the construction of a bridge, as raft ferries, and as single-ponton ferries. A unit of heavy ponton bridge (25-ton) consists of four

*A balk is a longitudinal stringer which helps support the flooring of a ponton bridge.

trestles, twelve pontons, and the floor system, plus accessories. The unit provides approximately 250 feet of heavy ponton bridge. One unit of equipage is issued to each of the four bridge platoons of the heavy ponton battalion. The present type of heavy ponton bridge is capable of supporting the heaviest loads used by the army. Heavy ponton equipage is much heavier than light ponton equipage, and consequently more time and labor are required for the construction of the heavy ponton bridge. The chief advantage in the use of the heavier bridge is its greater capacity. Heavy ponton raft ferries are also capable of supporting the heaviest loads used by the army. In general, the rafts are the same as one or more spans of the heavy ponton bridge, reinforced if necessary.

A heavy ponton, made of aluminum, is 32 feet 6 inches long, 6 feet 6 inches in beam, and weighs 2,665 pounds. It will support a load of 30,500 pounds, with a freeboard of 6 inches. A single heavy ponton will transport two infantry rifle platoons, with individual equipment, and a crew of 9 engineers, or 2 engineers with an outboard motor.

It is apparent from the discussion in preceding paragraphs that there are many possible combinations of the various means of crossing rivers. Since all engineer work is based upon tactical requirements, it is convenient to consider the actual crossing of a river in three phases:

(1) The surprise crossing of the initial wave, usually on a wide front.

(2) The reinforcement of the initial wave by the crossing of the remainder of the bridgehead troops* in order that they may advance and seize a bridgehead.

(3) The crossing of the main body, with such trains and artillery as are essential to the initiation of a coordinated attack from the bridgehead.

Disregarding the possible crossing of small numbers of infantry by swimming, there are two means of crossing the

*Those troops who occupy the far bank to such a distance from the bridge site that effective fire, either small arms or observed artillery fire, cannot be brought to bear upon the site.

initial wave, namely, assault boats and ponton boats. An assault boat may be more easily and quietly carried to the crossing points, while a ponton boat will carry nearly three times as many men to the load. Since the initial wave usually crosses on a wide front and secrecy is essential, assault boats rather than ponton boats should be used initially. They may be supplemented, if necessary, by the ponton

FIGURE 53.—Troops crossing a footbridge.

boats, but later need for the pontons for rafts or for a ponton bridge should be given due consideration. Parachute infantry might be employed to place the initial wave on the opposite bank.

For transporting the remainder of the bridgehead troops, footbridges may be employed in addition to the assault boats. Whether to continue the crossing of the support and

reserve of the bridgehead troops on the same wide front as the initial surprise wave, to use the bottle-neck represented by the footbridge, or to employ both means, is a matter for tactical decision.

The footbridge cannot be constructed until enemy rifle and machine-gun fire from the far bank has been eliminated. Artillery fire or aerial attack can also prevent the construction if the site is under observation. Chemical smoke can be advantageously employed to conceal the construction of the footbridge.

When the enemy situation on the far bank is fairly well known, it may be expedient to choose one site for the footbridge, move the material as close to the site as practicable under cover, and start the construction as soon as the situation on the far bank will allow. When the opposition to be encountered by the initial wave on the far bank is uncertain, it may be better to select two or more sites for the footbridge. The troops and materiel should then be held in a central position, readily accessible to all of the sites, until the situation on the far bank has cleared sufficiently to justify a decision as to the best site for the footbridge. This procedure will probably delay the starting of the bridge, because the materiel cannot be shifted speedily; however, such a procedure will save time in the end if it results in placing the footbridge where it can be constructed and used without undue interference by the enemy. Such matters should be discussed by the tactical commanders with their unit engineers during their joint reconnaissance. The decision as to procedure is the responsibility of the tactical commander.

The crossing of motor vehicles and artillery requires the use of either ponton rafts or a ponton bridge, or both. In any case, approaches to the raft or bridge sites and the routes away from the landing on the far bank are of great importance. The engineers not only must establish means of crossing the water, but also must provide through routes of communication from the rear to the front. If the terrain permits free cross-country movement of vehicles,

great latitude in the choice of ferry or bridge sites is possible. When movement is difficult, the choice is more restricted; it may sometimes have to be confined to existing routes or those that can be readily repaired. The construction of either a ferry or a ponton bridge involves the concentration of a considerable number of men and materiel in a limited area. It must, therefore, be postponed until

FIGURE 54.—Vehicles crossing on a ponton bridge.

the far bank has been cleared of enemy to such a distance from the bridge site that effective fire, either small arms or observed artillery fire, cannot be brought to bear upon the bridge site. If the enemy has had ample time before the crossing to reconnoiter the ground thoroughly and register his artillery fire, he may be able to interfere seriously with bridging operations, even after his observers have been

driven back. Antiaircraft protection and control of the air will usually be of prime importance.

Another point that must be considered in connection with the crossing of vehicles and artillery by rafts is the later use to be made of the ponton equipage. With limited equipment, it may be necessary to operate rafts for the crossing of the essential combat vehicles and assemble the pontons later for the construction of a ponton bridge. Many unforseen contingencies may arise to prevent the carrying out of such a plan on schedule. The allotment of engineers and materiel to the rafts, to the bridges, or to both, and the proper time for initiating each task, is the responsibility of the tactical commander. In arriving at his decision, however, the tactical commander should give careful consideration to the recommendations submitted by his engineer officer.

A much more favorable condition exists when the engineers and ponton equipment suffice for the simultaneous construction of both rafts and a pontoon bridge. Raft ferries can be put into operation more quickly, but their capacity is not nearly as great as that of the ponton bridge. If the stream is only 300 feet wide, a ponton bridge can be put into operation in about the same time as a ponton ferry. Nevertheless, it will usually be advantageous even in such a case to construct both rafts and a bridge, in order to increase the flexibility of the crossing operations. If the ponton bridge is the only means for crossing vehicles, all the tactical commander's eggs are in one basket. If anything happens to the ponton bridge, his entire plan may be disrupted. If ponton ferries are available in addition to the ponton bridge, the crossing of his vehicles may be delayed, but will probably not be stopped altogether during the time necessary to repair the bridge.

If, on the other hand, the river is 1000 feet wide, the construction of a ponton bridge, including the approaches, will probably require at least eight hours. If ponton ferries can be put into operation in two hours, they will have six hours in which to operate before the bridge is completed.

Two ferries carrying three trucks each and making a round trip in 20 minutes can transport 6x3x6 or 108 trucks before the bridge is in operation. The same number of trucks, allowing 27 yards to the truck and a speed of 5 miles per hour, could cross and clear the bridge in about 20 minutes, as against the 6 hours required to ferry them over on two rafts; nevertheless, the use of the rafts in such a situation would probably be desirable in order to have alternate means available.

It must be borne in mind that the crossing of a river in the presence of the enemy is not an end in itself; it is merely a necessary operation preliminary to the launching of a coordinated attack on the far bank. Proper provision must accordingly be made for the timely repair and maintenance of routes on the far bank, which are necessary for the advance of the bridgehead troops, the movement into position of the main body, and the tactical and supply movements incident to the attack itself.

SUMMARY

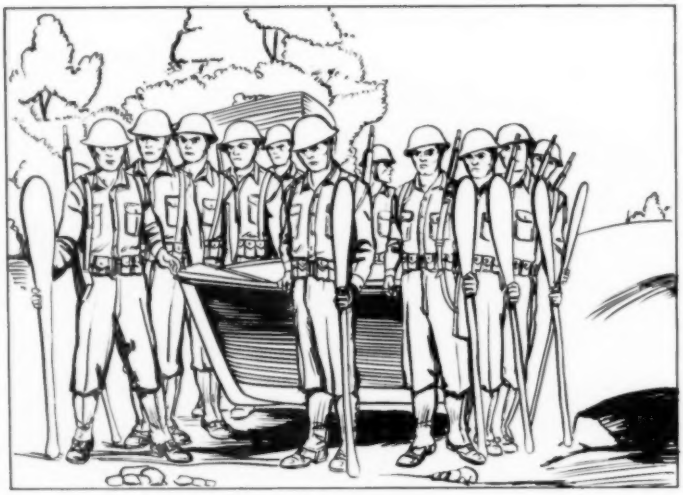
Four types of engineer units may be available to assist a triangular infantry division in a river crossing: the division combat engineer battalion, the corps combat regiments, light ponton companies from army or GHQ reserve, and the heavy ponton battalion from GHQ reserve. The division combat engineer battalion is permanently assigned to the division; engineers and equipment from other types of engineer units are temporarily attached to the division when and as needed. The commander of an infantry regiment or battalion making the initial crossing should have attached to his command sufficient engineers and materiel to effect the crossing.

Elements of the division may cross the river by means of assault boats, footbridges, light ponton rafts and bridges, and heavy ponton rafts and bridges. Decision as to the means of crossing rests with the tactical commander. While assault boats may suffice for the initial wave, consideration should be given to utilizing footbridges, rafts,

or complete ponton bridges as soon as practicable in order to build up the strength of the elements on the far bank.

A fixed time schedule in which different phases of the crossing are rigidly bound together and dependent on each other should be avoided. Rather, the plan of crossing should be simple and flexible. Alternate plans should be prepared for use in emergencies. At least a fifty percent reserve of boats and bridge equipment should be maintained to replace possible losses and thereby prevent abandonment of any planned phase of the crossing.

The river crossing itself is merely a necessary operation to further the continued forward movement after reaching the far bank.



CHAPTER 6

The Sandtable Goes Modern

The sandtable with which most officers are familiar is a large, bulky affair 4 by 8 feet or more in size and from 8 to 12 inches deep. Such a table literally contains more than a ton of sand. It is entirely too heavy to move about, and requires a large room devoted almost exclusively to its use. This type of sandtable employed for reproduction, to scale, of an actual piece of terrain has a place in certain types of special training; for example, a small-scale operation against a specific objective, such as a raid, an attack against a fortified position, or a parachute attack. It may also be employed to great advantage in teaching terrain appreciation and ground forms. Chapter 5, Volume XVIII, of "The Mailing List" is an excellent presentation of the construction and use of such a sandtable.

Recent classes at The Infantry School have seen demonstrated a modern, streamline version of the sandtable. This table is so light, mobile, and easily prepared that it is entirely practicable to have one in every squad room. It can be packed easily, and moved for outdoor use. This table has been used in two forms; one, three to four feet square and approximately four inches deep; the other, approximately three by five feet and only two inches deep. Either type requires but two standard, engineer sandbags of sand. These small tables may be emptied quickly, and the box or tray, together with the bags of sand, stored along the walls of a room, out of the way.

The tray-type table is constructed by nailing a piece of ordinary wallboard to a frame made of one by two-inch strips of salvage lumber. For continued use, the wallboard should be reinforced by nailing several strips of wood

across the bottom of the tray. (See Figure 55.) The inside of the tray should be painted to reduce absorption of water by the wallboard. If blue paint is used, it will add realism by giving large streams or bodies of water a characteristic color.

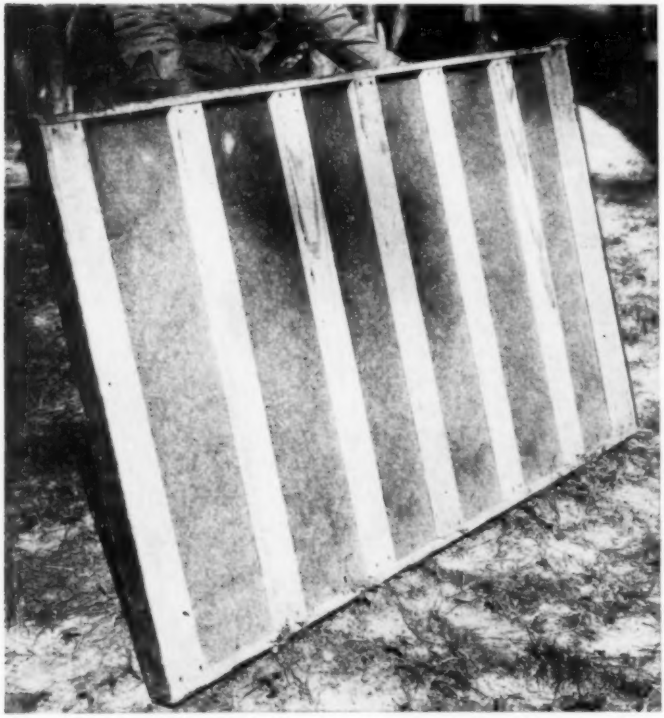


FIGURE 55.

A heavy stand is neither required nor desirable. The tray should be placed on a trestle or on boxes, and sloped in such a manner as to permit the class to sit down and still see. (See Figure 56.) In a squad room, this may be accomplished

by placing one side of the tray on two stacked trunk lockers and the other on one.

The only materials required to construct a satisfactory sandmodel are a sharpened stick, a few small blocks of wood or pieces of issue soap to represent buildings, and one or two small, flat pieces of wood to represent bridges. More elaborate materials, such as bridges and buildings whittled out of soft wood, pieces of sponge fastened to straightened paper

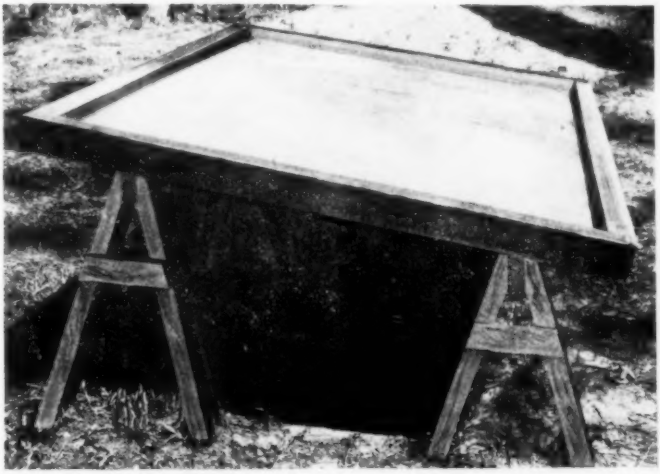


FIGURE 56.

clips to represent trees, and powdered green chalk, may be employed if desired. Do not scorn the use of toys; an overturned truck or a dead horse adds interest for the men and helps them to remember. Care should be taken, however, to see that such embellishments are not so elaborate as to become interest-distracting factors.

To build a sandmodel, the sand should first be moistened sufficiently so that when a handful is grasped and released, it will retain its shape.

Regardless of the model to be constructed, the first step is always the same: dump one bag of sand on the tray, distribute it evenly, and smooth it down. A piece of newspaper spread over the sand and rubbed with the palm of the hand will result in a fine, smooth job.

With the finger, mark in the sand the principal streamline. If this is made sufficiently deep to expose the bottom of the tray, the streamline will be emphasized. The sand pushed to the sides of the stream by this operation may be left to represent the trees or brush normally found along the banks of streams. (See Figure 57.)

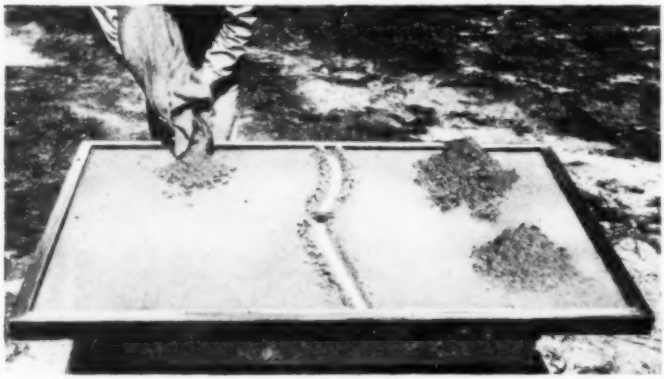


FIGURE 57.

From the remaining bag pour additional sand onto the model to form hills in the desired places. By varying the amounts and pouring it carefully in the places where high ground is desired, very little modeling will be necessary. Smooth off the hills and ridges, shaping them to the desired form. Exact sizes are unnecessary. A reasonable proportion, estimated by eye, will suffice.

Next, draw the roads in the sand. The conventional signs used on maps may be used for this purpose. They are easily drawn with a sharpened stick. The end of a half-inch piece

of thin board, such as the lid of a cigar box, may be whittled out to form two points and used for this purpose. Likewise, a simple, concave roller can be built and used to draw roads. A railroad is also represented by the map conventional sign.

Minor streamlines are next drawn in, small blocks of wood or issue soap are placed to represent buildings, and flat pieces of wood are placed across streams to represent bridges. Small amounts of loose sand dropped onto smooth sand make an excellent representation of woods. Realism is added if the woods are sprinkled with powdered green chalk. A salt shaker provides a handy means for accomplishing this, or green chalk rubbed on a piece of wire screen, held over the area, will achieve the same result.

The scale of the model is easily presented by showing the class a stick, broken to the desired length. A convenient scale is to have the stick length represent 600 yards, the effective range of small-arms fire.

Direction is readily indicated by placing a cardboard arrow pointing to north on the sandmodel.

FORMULATING THE PROBLEM

The instructor who plans to use the sandtable must first decide upon the basic principles he wishes to illustrate. His next step is to find a problem which properly presents those principles. The Mailing List, The Infantry Journal, Conference Course Training Bulletins, military history books, and newspaper articles contain many situations which can be adapted to sandtable use. Personal experiences of the instructor or a member of the class can often be adapted to this use.

It is usually more difficult to adapt a situation, however, than to develop a problem oneself. The instructor presenting his own problem is assured that it includes all the elements he intends to present. Likewise, since he has prepared the exercise, very little additional preparation and few, if any, notes will be required to insure a fluent and complete presentation.

The preparation of problems for sandtable use does not require literary talent. A small amount of imagination is all that is necessary.

Assume that a problem is needed to illustrate the manner in which a patrol should cross a ridge line; enter, pass through and emerge from woods; and cross a clearing. Obviously, the sandmodel to be used in such a problem must contain a crest, a large woods, and a clearing. The simplest kind of situations, moving the patrol from one to another of these terrain features, will suffice. As the patrol moves out to accomplish its mission, the patrol leader is confronted with each of the above terrain features and must issue orders to move his men accordingly. Thus, the requirements of our problem present themselves.

The initial situation and requirement should be designed to grasp and hold the interest of the students.

The first requirement should be relatively easy of solution. The succeeding requirements should be progressively more difficult, thus allowing the class to gradually "work into the problem."

Having organized his problem in his mind, the instructor should make a rough sketch showing the principal terrain features involved. He should then solve his problem, making marks and notations on the sketch. From this planning, he can make a list of the special materials he will need to present his instruction. These will be, principally, tabs of cardboard to represent the men or units involved in the problem. The sketch can be used later in building the sandmodel and as an outline for the instructor, when he presents the problem to his class.

CONDUCTING A PROBLEM ON A SANDTABLE

With the class assembled around the sandtable, the instructor should point out the prominent terrain features of the ground which the class is observing and explain the scale used for the problem. A few students should be asked to explain the terrain, to insure that all members of the class understand the terrain.

Then the instructor states the tactical situation. The initial situation, as prepared by the instructor, should be brief and simple, describing the situation as it exists at the outset of the action in the exercise. Here, as in all military training, simplicity is of prime importance. The situation in any case states: known elements of enemy information which will affect the action of the unit; pertinent information of own friendly, adjacent, and supporting troops; mission of the unit; and the location of the next higher unit commander. The initial situation should assign the unit a definite mission in the midst of a clearly defined combat phase. However, presenting too much information of the enemy, more than logically could be known, should be avoided.

The instructor next presents the first requirement which will bring out one of the tactical principles it is desired to present in the problem. After the first requirement has been presented, the students are allowed a few minutes to study the situation, and are then required to write their solutions on paper. Since each man writes his solution before anyone is called upon to present an answer, all members of the class are compelled to think for themselves and will not wait hopefully for someone else to be called upon.

The instructor now calls upon one member of the class for his solution and discusses it. Other solutions are called for and also discussed. When the instructor is satisfied that a phase of instruction has been adequately covered, he presents the next situation.

Following are four examples of problems. Their purpose is to serve as examples, and to present ideas from which commanders of small units can create problems better adapted to their needs.

A SANDTABLE EXERCISE BASED UPON AN HISTORICAL EXAMPLE

POINTS ILLUSTRATED:

1. Necessity for rifle protection of machine-gun crews.
2. Effectiveness of flanking fire.
3. Necessity of initiative in noncommissioned officers.

MATERIALS REQUIRED:

1. Tabs to represent Mezy, Charteves, Jaulgonne, point, advance party, 2 one-half squads.
2. Enemy machine gun (cardboard).

Situation: (See Figure 58.) During the early stages of the Aisne-Marne offensive an American battalion was ordered to cross the Marne River at Mezy and advance to the northeast via the Mezy-Charteves-Jaulgonne road. (*Instructor indicates points as they are mentioned.*) The Germans in this locality were reported to be withdrawing rapidly.

Company B, designated as the advance guard of the battalion, sent out its 1st platoon as an advance party. At 5:30 AM the advance party, preceded at 150 yards by a point consisting of one squad, crossed the river. The advance party commander at once sent out two flank patrols of four men each. These two groups marched at a distance of about 100 yards from the flanks of the advance party.

(*Instructor inserts tabs in proper places as they are mentioned.)*

The movement toward Charteves continued.

Just as the point entered Charteves, an automatic weapon opened fire on the advance party from the high ground west of the town. This flanking fire caused the advance party and the two flank groups to halt in the positions indicated.

The corporal commanding the point was aware of the situation we have just outlined. There was no indication that the town and the vicinity immediately to the north thereof were occupied by the enemy.

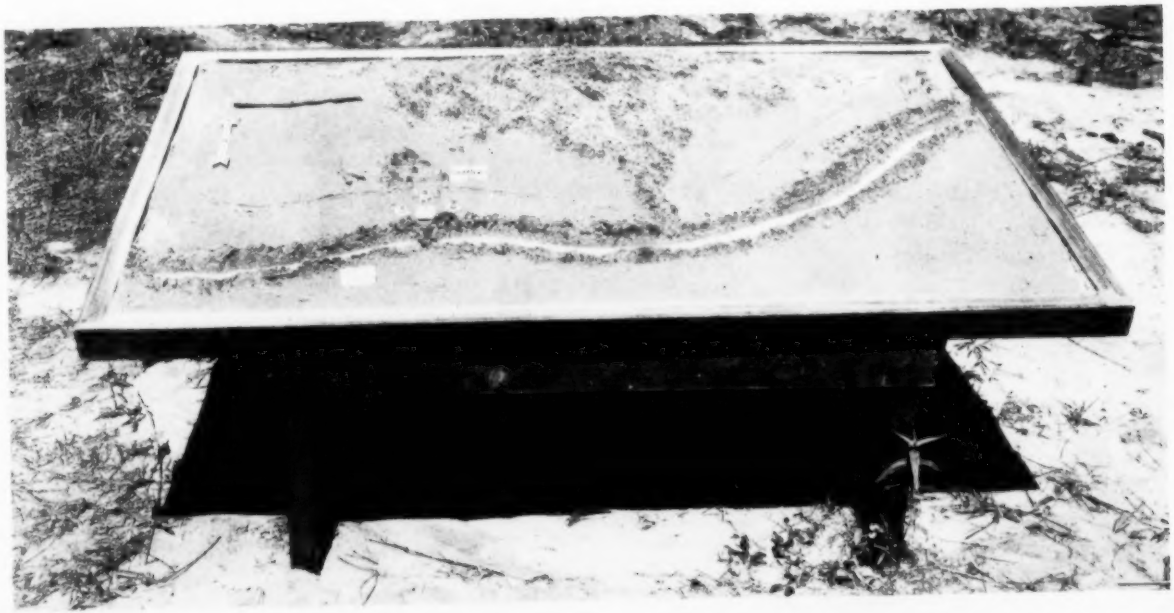


FIGURE 58.—Sandmodel at beginning of Historical Example Exercise.

First requirement: Action taken by the corporal commanding the point.

(Various members of the class are called upon and required to move the tabs according to their respective solutions.)

Historical solution: The corporal led the point through the town, and taking advantage of the cover afforded by the buildings, attacked the enemy position from the north and west. A machine gun and two of its crew were captured.

(Point is moved through the village and to the flank of the enemy positions, after which the machine gun is removed.)

Discussion: The initiative and intelligence displayed by this noncommissioned officer were commendable. His normal mission as point commander was reconnaissance and the protection of the advance party from surprise attack. He could have fulfilled this mission merely by taking up a covered position and awaiting instructions from the advance party commander.

However, this noncommissioned officer realized that the mission of the advance guard was then, as always, to push forward aggressively and, in so far as it was able, to insure the uninterrupted advance of the main body. He also appreciated the fact that his point was the only unit in the advance party that was in a position to maneuver against the enemy group without great loss.

True, the movement to the west against the position meant that he would have to leave the original front of the advance party temporarily uncovered. However, the corporal had noted that the village and the ground to the north apparently was not occupied by the enemy. The advance party commander was not in a position to know this; therefore, the point commander was entirely justified in moving against the machine gun on his own initiative.

It was fortunate for the Americans that the Germans had left this machine gun behind with no riflemen to protect it. Only under the most desperate circumstances is such action

justified. In this instance the Germans apparently believed that the sacrifice of the gun and its crew was warranted by the time that would be gained for the withdrawal of the main body.

Situation continued: After putting the machine gun out of action, the advance party halted on the eastern edge of the village until the remainder of the company crossed the river. It then resumed the march along the road to Jaulgonne.

As the advance party reached a point about 300 yards from the sharp bend in the road, it was fired upon by automatic fire from the edge of the woods about 500 yards north of the road. (*The machine gun is placed at the edge of the woods.*) The point and the advance party hit the ground, took what cover they could find, and returned the fire. *(Instructor moves the point and advance party as indicated.)* The advance party attempted to advance by successive rushes of two men at a time to build up the line established by the point, but the hostile, flanking fire was so accurate that one of the first two men to move forward was hit. The slightest movement drew fire. Further efforts to move the advance party forward had to be abandoned.

Second requirement: Action taken by the commander of the advance party.

(Instructor calls on several members of the class for their solutions, having them move tabs as their solution indicates.)

Historical solution: The leader of the right-flank patrol worked his patrol down the slope toward the river until it was defiladed from the enemy fire. It then moved east until it entered the woods. From there, the patrol moved on the enemy position from the rear and put the group out of action.

Discussion: In this situation the advance party has again been caught in the open by automatic, flanking fire. There are about 500 yards of open ground between the platoon and the woods. A frontal attack would obviously be costly. *(Instructor points out on the ground the various maneuvers as*

they are discussed.) The platoon leader must therefore look for some other means to stop this fire. A flanking movement should immediately suggest itself. The woods are fairly close to his left-flank patrol, but this group is directly in the line of fire of the machine gun. The right-flank patrol, although it is farther away, is located on ground sloping rather sharply toward the river. It is apparent that if these four men crawl toward the river, they will soon be defiladed from the enemy. They can then move along the river until they gain the woods. From there, providing enemy riflemen do not detect them, they can move north through the woods, then west, and come upon the machine-gun position from the rear.

A third solution would be to signal the point to make a dash for the woods. If the point succeeded in reaching the woods, it could then attempt to outflank the position. The disadvantages of this plan are obvious. First, the point would unquestionably suffer heavy casualties from flanking fire; second, the movement being clearly visible to the enemy, all surprise effect would be lost.

The flanking maneuver by the right-flank patrol seems to be the best solution and should have been ordered by the advance party commander. Actually, as stated in the historical solution, the maneuver through the woods was made by the leader of the right-flank patrol without orders. Here again we see an example of the aggressiveness and initiative which are essential in the noncommissioned officer.

The maneuver succeeded without difficulty, thanks again to the fact that no riflemen were protecting the enemy machine gun.

A SANDTABLE EXERCISE BASED UPON A PERSONAL EXPERIENCE OF A MEMBER OF THE CLASS

POINTS ILLUSTRATED:

1. The composition, equipment and conduct of a reconnaissance patrol.
2. The importance of the selection of a tentative route prior to moving out.
3. One formation of a patrol.

MATERIALS REQUIRED:

1. Tabs to represent: each member of the patrol; enemy riflemen; Jones Hill.
2. Two matches tied together with 6 inches of string (radio).
3. Approximately 12 feet of string (for use of class in indicating route).

Sergeant Pipp, whose personal experiences while on maneuvers form the basis for the exercise, should be present to tell the class the solutions which he made when confronted with these situations.

Situation: (See Figure 59.) The 2d Platoon of Company E was located just off the west edge of the sandtable. The platoon leader, believing the enemy to be located in the vicinity of Jones Hill and desiring more specific information, called Sergeant Pipp. After acquainting him with the situation, the platoon leader gave him the following instructions:

"Sergeant, I want you to select a patrol of not more than six men and proceed at once to Jones Hill to gain information of enemy activity. (*Instructor points out each location as it is mentioned.*)

"You will move generally along this road A-B, remain in observation from Jones Hill until dark, which will be about 7:20 PM. You will then return and report to me here. It is now 3:15 PM. Any questions? Move out."

First requirement: What is the first thing you would do in planning the actions of this patrol? (*The instructor calls on two or three members of the class for their solutions.*)

Sergeant Pipp's solution: I studied the map and selected a suitable route of approach to Jones Hill and another route for return from Jones Hill, after dark.

Second requirement: Show these general routes on the table by use of this string. *(Instructor calls on several members of the class, and has them lay out the string on the table to represent their routes.)*

Sergeant Pipp's solution: I decided to follow a route during daylight generally parallel and to, and south of the road, seeking concealment along the edge of the woods. I planned to leave this route in order to investigate any terrain features that needed special investigation. These were the woods at A, the buildings near B, and the crest south of C. For my return I selected a route generally between the road and the route we followed moving out. On this return route I sought to avoid woods because of the noise incident to passing through them. I also sought to avoid crests and ridge lines where the silhouette of my men would be seen. (*Instructor places string in accordance with the route described by Sergeant Pipp.*)

Situation continued: Assume you have selected the route shown by the string and are now ready to select your patrol.

Third requirement: What men would you select for this patrol? (*Instructor calls on several of the class members for their solutions.*)

Sergeant Pipp's solution: I selected four men: two riflemen and two scouts. No automatic riflemen or grenadiers are necessary for this mission. A reconnaissance patrol fights only for self-protection; their primary mission is observation.

Fourth requirement: What procedure would you follow prior to moving out? (*Instructor calls on several members of the class for their solutions.)*

Sergeant Pipp's solution: Before departing, I questioned each member of the patrol to be sure that he understood thoroughly our mission and route. I inspected each man to see that no equipment which might glitter was exposed, that the men were armed with rifles and ammunition, that each

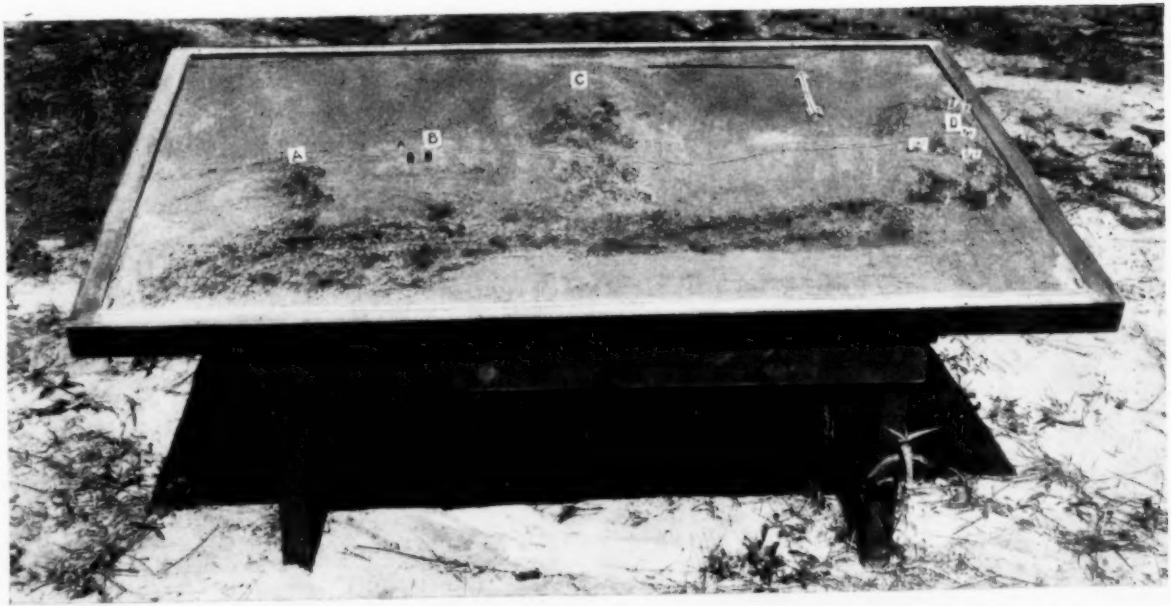


FIGURE 59.—Sandmodel at conclusion of Personal Experience Exercise.

knew the patrol's recognition signal, and that all identifications other than their dog tags were removed. I prescribed the initial, diamond formation of the patrol and designated a get-away man.

Situation continued: The patrol moved along the prescribed route until it reached a point opposite the buildings at B.

Fifth requirement: What are your actions at this time? (*Instructor calls upon several members of the class for their solutions.*)

Sergeant Pipp's solution: The point man was sent to examine these buildings while the rest of the patrol covered his advance from the edge of the woods. The point reconnoitered each of these buildings, then, finding them unoccupied, signalled "Forward" and rejoined the patrol.

Situation continued: As the patrol approached the crest south of C, the left-flank man signalled "Enemy in sight in small numbers" with his rifle. The leader halted the patrol and the left-flank man pointed out a group of three men on Hill C. This group was setting up a radio-receiving set. They apparently had not observed the patrol. No other enemy troops were in sight. (*Instructor places three red tabs on Hill C and inserts the two match sticks and string to represent their radio antenna.*)

Sixth requirement: Actions of the patrol leader at this time. (*Instructor calls on members of the class for their solutions.*)

Sergeant Pipp's solution: I first satisfied myself that the enemy had not observed my patrol. I then gave the order to continue on the mission and moved the patrol back down the hill on our prescribed route. The mission of the patrol was definitely one of reconnaissance. Unnecessary combat was to be avoided. I made a notation of what we had seen in order to report it to my platoon leader.

Situation continued: The patrol proceeded to the vicinity of Jones Hill. After first observing the hill for some time, the patrol moved to the hill and halted at point D. It was now 5:30 PM. (*Instructor moves tabs to D, at the top of Jones Hill.*)

Seventh requirement: As patrol leader, what are your actions at this time and your plans for the completion of your mission? *(Instructor calls on several members of the class to move tabs into position to observe from Jones Hill.)*

Sergeant Pipp's solution: I distributed the patrol generally just east of the crest of Jones Hill. The time of day was such that we could not observe for much more than two hours. Therefore, it was unnecessary to arrange for relief of observers. I placed two men on the northern end of Jones Hill and two men on the southern end. Each pair was instructed that one man would observe for 15 minutes, when he would be relieved by his partner for the next 15 minutes. I stationed myself east of Point D. (*Instructor places tabs at the points mentioned.*) I planned on remaining in observation until dark and then returning to the platoon leader by way of the route I had previously selected.

A SANDTABLE EXERCISE BASED UPON A SUBJECT SCHEDULE

POINTS ILLUSTRATED:

1. Mission, formation, and conduct of a flank security patrol.
2. Patrol leader's orders and preparation to initiate the advance.
3. Duties of the leader, each member and second-in-command of a flank security patrol.
4. Relation between rate of march, terrain traversed, and provision for security and control.
5. Contact with the marching column.
6. On encountering the enemy, the patrol leader's rapid estimate of the situation and clear concise order,including use of arm-and-hand signals.
7. Patrol leader's coordination of fire and movement.
8. Conduct of individuals during the attack; including alertness for orders and signals, use of cover and concealment, observance of technique of fire, teamwork, discipline, and aggressiveness.
9. Actions of patrol leader and second-in-command in supervising and correcting performance of individuals.

MATERIALS REQUIRED:

1. Tabs to indicate points A, B, C, D, 1, 2, 3, 4, enemy position, company, and each man in the squad.

One Friday afternoon, at a conference of the company officers, the company commander of a rifle company announced that the four-hour period allotted to Combat Training of Rifle Squads on the schedule for the following Monday would consist of a test, under his supervision, of the rifle squads. Platoon leaders were further advised that the scope of the test would include the subjects covered in the Second Period of Section I, Conference Course Training Bulletin No. 53.

One of the platoon leaders decided to devote to sandtable instruction the two hours allotted him to prepare his platoon for this test. Investigation showed that the Training Bulletin reference, above, refers to the squad as a flank security patrol acting over varied terrain. From the scope of training and the sketch on pages 6 and 7 of Training Bulletin No. 53, he prepared the following sandtable exercise to illustrate the points on which his platoon was to be tested the next Monday.

Situation:—(See Figure 60.) Your squad has been sent out from A as a security patrol, to protect the right flank of the rest of the company as it moves from A to D. The general route of the patrol has been prescribed as passing through points 1, 2, 3, and 4. As soon as the rest of the company has cleared D, the patrol is to rejoin the company. Contact with the enemy is not expected in the near future.

(*Instructor indicates each point on the sandmodel as it is mentioned.*)

First requirement: What elements determined the selection of the route?

(*Instructor calls on several members of the class for their solutions.*)

Solution to first requirement: The distance to which a flank patrol operates is generally the effective range of small arms fire (600 yards). The crests of prominent terrain features crossed provide good observation for the patrol. (*Using the scale stick, the instructor shows how the*

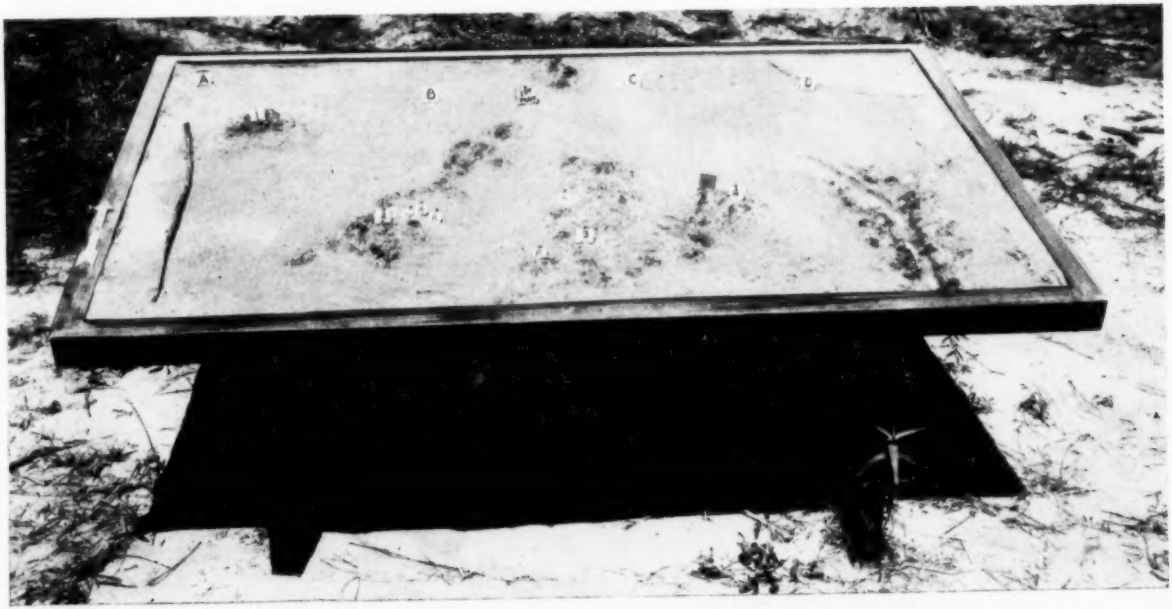


FIGURE 60.—Sandmodel showing solution to sixth requirement of Subject Schedule Exercise.

distance remains generally constant. Instructor points out hill crests.)

Second requirement: What actions should be taken by the squad leader, and what points should he cover in his order before moving his squad out on this mission?

(*Instructor calls on several members of class for their solutions.*)

Solution to second requirement: Squad leader should explain the situation and mission to each member of his squad. He should announce the initial formation. He should designate one man (left flank) to maintain contact with the rest of the company. He should check to see that each man is properly armed and equipped. He should designate a second-in-command.

Situation continued: The patrol moves out from A in a diamond formation. Upon reaching Hill 1, the patrol leader sees the group of buildings ahead.

(Instructor moves tabs to position indicated.)

Third requirement: What actions should the patrol leader take at this time?

(Instructor calls on several members of the class for their solutions.)

Solution to third requirement: Patrol leader should halt his patrol and designate two men to inspect the buildings while the rest of the patrol remains in firing position ready to cover their search.

(*Instructor moves tabs as indicated.*)

Situation continued: The buildings are found to be unoccupied and the patrol is signaled "Forward."

Fourth requirement: What formation should the patrol leader adopt for passing through the building area?

(*Instructor has several members of the class come forward and move tabs to show their methods of passing this area.*)

Solution to fourth requirement: Patrol should pass bebetween buildings in a staggered formation. Men should keep close to the building walls, and maintain at least 10 paces interval.

(*Instructor moves tabs to indicate this formation and movement.*)

Situation continued: As the patrol emerges from the building area and reforms in a diamond formation, the left-flank man, who had been told to maintain contact with the company, signals "Halt." The patrol leader observes that the company has halted at B, and that the men are falling out on either side of the road. A check of the time discloses that it is time for the hourly halt.

(Instructor moves tabs accordingly.)

Fifth requirement: What should be the decision of the patrol leader relative to the movement or disposition of the patrol while the company is halted?

(*Instructor calls on several members of the class for their solutions.*)

Solution to fifth requirement: The patrol has fallen behind the rest of the company and now has an opportunity to catch up; therefore, the patrol leader should continue the movement of the patrol even though it will mean that his men will lose this rest period.

Situation continued: The patrol reaches the crest of Hill 2 and pauses to observe. The patrol leader sees Woods 3 ahead.

(*Instructor moves tabs as indicated.*)

Sixth requirement: What should be the actions of the patrol leader?

(*Instructor calls on several members of class for their solutions.*)

Solution to sixth requirement: The patrol leader should send two men forward to reconnoiter the woods while the rest of the patrol assume firing positions on the eastern slope of Hill 2.

(*Instructor moves tabs as indicated.*)

Situation continued: While the two men are searching the woods, the sound of intermittent rifle fire is heard coming from Hill 4. The rest of the company has advanced to C. The fire is apparently directed at them, for they have halted and are seeking cover. The two men who were

searching the woods have just returned to the edge of the woods and signalled that the woods are free of the enemy.

(Instructor inserts tab indicating enemy on Hill 4 and moves tabs of company and patrol as indicated.)

Seventh requirement: What should be the actions of the patrol leader in this situation?

(Instructor calls on several members of the class for their solutions.)

Solution to seventh requirement: The patrol leader should signal the men at the edge of the woods to stay where they are. He should then order his second-in-command to lead five men through the woods on the southwest slope of Hill 4 and attack the enemy position from the flank. This group should be supported by the squad leader and the rest of the squad who should move through the woods and attack the enemy by fire from the eastern edge of the woods.

(Instructor moves tabs as indicated.)

AN ORIGINAL SANDTABLE EXERCISE

POINTS ILLUSTRATED:

1. Every commander, no matter how small his unit, is responsible for the security of that unit.
2. Observation is essential to security.
3. Whenever possible, before occupying a position, either for observation or for defense, dangerous localities within effective, small-arms range of the position should be reconnoitered.
4. Any installation, the safeguarding of which is required, must be carefully examined to insure that any enemy preparations for delayed destruction have been nullified.

MATERIALS REQUIRED:

1. Cardboard tabs to represent: each member of the rifle squad; the mortar squad; a ¼-ton truck; a 2½-ton truck; enemy position; point A.
2. A cap pistol, or firecracker and match.
3. A piece of string about 3 feet long.
4. A spring-type mousetrap.

The effectiveness of any sandtable exercise may be greatly increased if, by initiative and ingenuity, the instructor introduces the element of surprise. An example of such an expedient is included in the problem which follows.

Preparation: Prior to placing the sand in the tray to construct the model for this problem, tack a small, spring-type mousetrap to the bottom of the tray. Attach a light piece of string to the bait trigger, so that when the string is pulled, it will spring the trap. Run the string to the instructor's side of the table in such a manner that it will not be seen by the class. In constructing the model, care must be taken to prevent setting off the trap. Also, the trap's location must be carefully marked to insure that the end of the bridge is placed directly over the trap as shown in Figure 61. The only other precaution is that the bridge

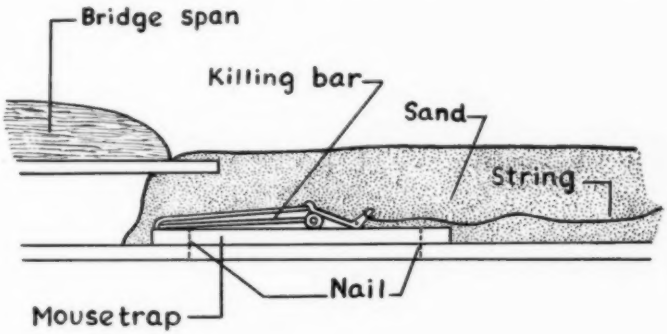


FIGURE 61.—Detail of mousetrap and bridge setup.

span be long enough so that one end will extend over the sand-covered trap, which cannot be exposed in the stream.

Situation:—(See Figure 62.) This model represents a small village, located in a valley and surrounded by four hills. Here is an outlying farm with its usual buildings and a lane leading to the road. The river to the north is swift and deep.

Your squad, with a 60-mm mortar squad attached, has been ordered to proceed north, by motor, along this road, and to seize and hold the bridge north of the village. The rest of your company, now located to the south of the village, is marching toward the bridge and expects to arrive there by 3 PM today. It is now 12 noon. There has been little enemy activity in this vicinity.

(Instructor indicates each feature of the model as it is mentioned.)

First requirement: What essential information has been omitted from the situation as given?

(Instructor calls on several members of the class for their solutions.)

Solution to first requirement: The transportation allotted to this detachment has not been specified. The detachment will have one ¼-ton truck and one 2½-ton truck allotted to it.

Second requirement: How far from the bridge is the company now?

(Instructor calls on several members of the class for their solutions.)

Solution to second requirement: 7½ miles.

Third requirement:—What method of advance should this detachment adopt in moving toward the bridge?

(Instructor calls on several members of the class for their solutions.)

Solution to third requirement: The detachment should advance by bounds, using the ¼-ton truck as the point vehicle.

Situation continued: As the ¼-ton truck arrives at a point on the road opposite the farmhouse, an automatic weapon located in the farmyard opens fire on it.

The truck pulls over into the ditch along the road and stops. The occupants, one of whom is wounded, dismount, take cover in the ditch and open fire. The leader of the detachment observes this action from the 2½-ton truck which has been halted about 500 yards in rear.

(Instructor inserts tabs representing the enemy group and the ¼-ton truck.)

FIGURE 62.—Sandmodel of Original Exercise after solution of fourth requirement.

Fourth requirement: Actions and orders of the detachment commander.

(*Instructor calls on several members of the class for their solutions.*)

Solution to fourth requirement: The detachment commander orders his men to detruck and take cover in the ditch beside the road and directs the driver to move the truck to a covered position. He then says, "The other truck has been fired upon from the farmyard. Jones, take three other riflemen with you and, moving around the back of the farmhouse, take the enemy from the rear. We will cover you by fire from here. Corporal Moss, put your mortar in position to fire on that target. Open fire at once."

(Instructor moves tabs as indicated.)

Situation continued: One member of the enemy group was killed and three others escaped, running to the northwest. The wounded member of the detachment has been given first aid and placed in the 2½-ton truck. The ¼-ton truck is disabled. The remaining members of the detachment have assembled in the farmyard. The 2½-ton truck is under cover near the farmyard.

(Instructor moves tabs as indicated.)

Fifth requirement: The decision of the detachment commander relative to the further advance of the detachment.

(*Instructor calls on several members of the class for their solution.*)

Solution to fifth requirement: The rifle squad should move forward as a dismounted patrol to reconnoiter the village. The mortar squad and the 2½-ton truck should remain under cover.

(Instructor moves tabs as indicated.)

Situation continued: The detachment commander, finding the village free of the enemy, signals the truck forward. He then posts two men in observation at the northern edge of the village and assembles the remainder of the rifle squad under cover of the buildings. The mortar squad in the 2½-ton truck arrives.

Sixth requirement: What are the actions and orders of the detachment commander?

Instructor calls on a member of the class to come forward and move the tabs to indicate his solution. The instructor should allow the movement to advance no further than the bridge, in order that some tabs may remain thereon. When the class member reveals by his solution that he has failed to inspect the bridge for mines or other delayed destruction devices, the instructor, at the psychological moment, pulls the string of the mousetrap and sets off the cap pistol. If a firecracker is used instead of the cap pistol, an assistant should light the firecracker. The result is amusing and highly instructive to the class. Before the entire class, the unwary member will have had the bridge he was to guard blown up, with tabs representing himself and most of his force with it. He and the rest of the class are not likely to forget this lesson.

If every member called upon takes the proper precautions, the instructor merely says, "Here's what would have happened if you hadn't checked the bridge," and goes through the same procedure.

(*Instructor then replaces the bridge.*)

Solution to sixth requirement: The detachment commander halts the truck under cover of the buildings and, after having the men dismount, directs: "Jones, take White with you and reconnoiter the south bank of the river for 500 yards to the east. Smith, take Brown with you and reconnoiter for 500 yards to the west. Corporal Bates (assistant squad leader), I am taking Black with me to reconnoiter the bridge. You place the remainder of the detachment in position here to cover us." He then moves out to inspect the bridge.

Situation continued: The south river bank has been reconnoitered and no enemy has been located. The bridge has been found to be safe.

Seventh requirement: What disposition should be made to hold the bridge?

(*Instructor calls on several members of the class for their solutions.*)

Solution to seventh requirement: Two riflemen should be sent to Hill A and two to Hill B to observe and gain early information of the enemy. By signals, they can warn the detachment of the direction and approach of any enemy.

The disposition of the remainder of the force should be made on the north side of the bridge. Thus, the detachment protects the bridge rather than the bridge protecting them.

The automatic-rifle team should be located so as to have a good field of fire in all directions.

One rifleman should be placed about 300 yards from the bridge on each flank.

The detachment leader should be in a central position for better control of his detachment.

The corporal, antitank grenadier, should be located near the detachment leader. This position permits his observation of the three most likely avenues of tank approach. It also allows him, in his capacity as second-in-command, close coordination with the detachment leader.

(*Instructor places tabs as indicated.*)

The 60-mm mortar should be emplaced in a defiladed position. The river bank on either side probably offers such a position. Ammunition supply of this weapon would be facilitated by locating the gun on the south side near the truck position.

The truck should be on the south side of the river, in a concealed and covered position with the driver designated as get-away man for the detachment.

CHAPTER 7

Obstacle Courses For Infantry

The soldier must be able to walk, run, crawl, creep, climb, and jump in order to accomplish his mission. Further, he must be able to do all of these things for prolonged periods, with full field equipment, without exhaustion, and without injury.

Obstacle courses are being given constantly increased attention as a result of the great stress now being placed on the physical conditioning of troops. However, especially in the case of recruits, several weeks of vigorous physical training should precede the obstacle course work. This is to condition the muscles and reactions to violent physical exercise. Most injuries occurring on obstacle courses have been found to be among untrained men who land heavily or awkwardly on hard ground.

In designing and constructing such a course a number of factors should be considered. The site of the course should be selected with a view of making it easily accessible to the units which are to use it. The size, shape, and contour of the ground available will determine to a great extent the general layout of the course.

The initial physical condition of the troops, or the type of conditioning required, should determine the difficulty of the various obstacles. The funds and materials available will determine to a great extent the materials to be used.

In the construction and use of an obstacle course, however, there are certain fundamental principles which should be kept in mind. In order that the course serve its purpose effectively, it must present a definite challenge to the physical prowess of the individuals. The obstacles should be neither too difficult nor too easy for the average soldier.

Negotiation of the obstacle should present a slight risk in order to add interest, but the element of fear should not be the principal feature of any obstacle. Injuries suffered by the members of the unit while running the obstacle course will tend to defeat its purpose.

The human reaction must be taken into consideration. The running of the course should be presented to the men as a game or other form of athletic activity. Free-time practice by the men should be encouraged. The course, where men voluntarily practice in their free time, is a popular one; but by the same token, the course which is deserted during free time probably has some serious faults.

Obstacle courses serve a dual purpose. They can be used to determine the physical capabilities of the individuals of a unit; and they can be used as a medium for the development of the soldier's physique and fighting spirit, by teaching him to overcome obstacles similar to those he must surmount in combat.

Only on rare occasions is a man encountered, all of whose muscles are equally well-developed and coordinated. A former able seaman would experience no difficulty in ascending the rope ladder, but might fail miserably in attempting the water jump. Therefore, having run the unit through the course, individual deficiencies at the various obstacles should be noted. Previously trained coaches then should give the men instruction in the proper methods of overcoming the obstacles in which each may be deficient.

A most important element in all obstacle-course work is the competitive spirit. Each man feels the spur of competition with his fellow soldiers, and he is eager to do better than the other members of his unit. For this reason the men should run the course in competition with others from their unit. Some men will always be found who lack the necessary coordination, but none should be allowed to become discouraged due to failure to negotiate an obstacle. Nor should this failure bring upon them the ridicule of other members of the organization. Rather, special training should be given until each man can complete all obstacles. Team competition

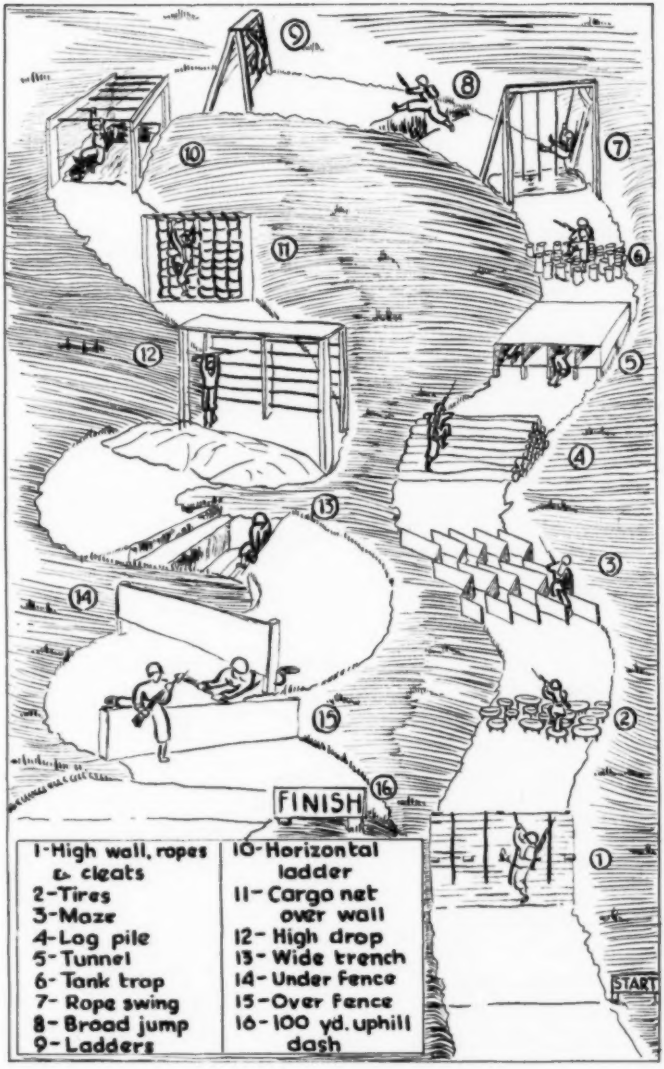


FIGURE 63.—Obstacle course of the 88th Airborne Infantry.

will cause the more skillful members to coach their less successful team mates. The force of group opinion is valuable in this instance, as most men will achieve the difficult in order to keep their places within the group. Commanders can greatly assist in the achievement of proficiency by demonstrating that they can negotiate all the obstacles. This is important, and rests upon the sound military psychology of never requiring your men to do anything that you would not or could not do. If the sergeant, lieutenant, or captain accompany the slow or awkward, setting the pace as a leader must, mutual respect will be gained.

Obstacles may be grouped according to type, as follows:

(1) Hurdles
(2) Fences
(3) Walls
(4) Ditches or trenches (water-filled or dry)
(5) Tunnels
(6) Ladders (vertical and horizontal)
(7) Mazes (vertical and horizontal)
(8) Wire (smooth and barbed)

The *hurdle* obstacle will be, by its nature, elementary and easy of accomplishment. In many courses the simple, low-wall hurdle, about three feet high, is the first obstacle the participant encounters. Due to this fact, the soldier will feel confident and ready for the next barrier as he clears a low hurdle with ease and speed. Whether the men should be required to clear the hurdle in any prescribed manner is a matter for the officer in charge to indicate. For example, on one hurdle the participants may be cautioned to use only one arm, on another, to jump without touching the hurdle with the hands. Another method is to have the men negotiate this obstacle in the same manner as for low hurdles in a track meet—with a good, running start and with either leg leading.

The *fence* is low and presents much the same problem as does the low hurdle, except that due to the single railing, it may appear higher than the low hurdle. For this reason, the men should be required to cross this obstacle with a running

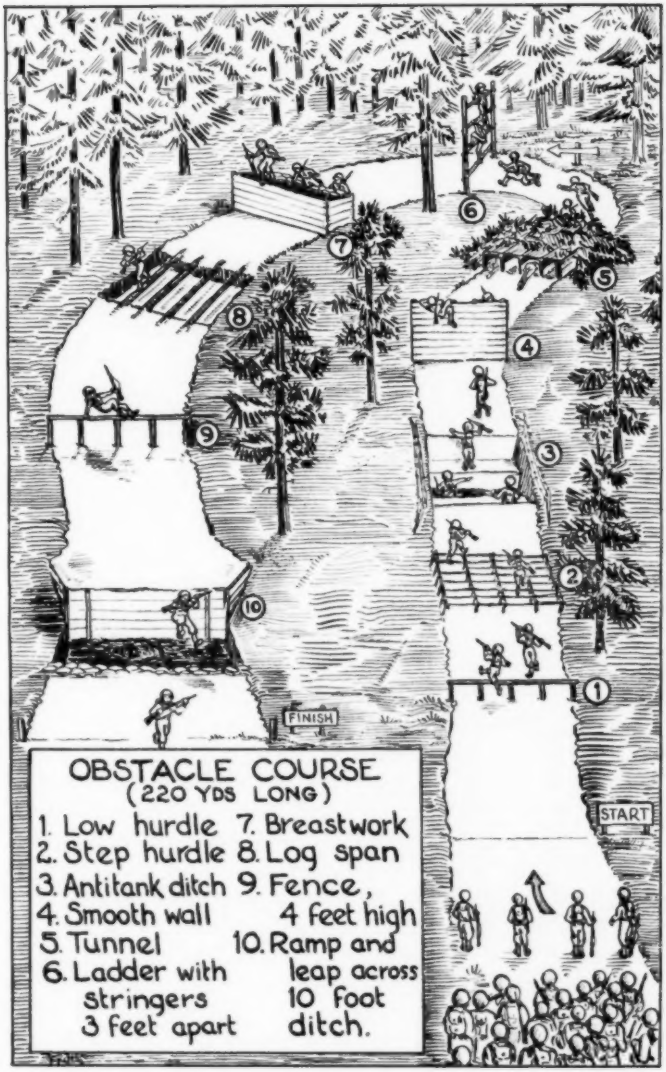


FIGURE 64.—Obstacle course of the 2nd Student Training Regiment, The Infantry School.

start and to swing over, with the body pivoting on either the left or right hand as it rests on the rail. This method will take some practice. Men who cannot cross the fence in this manner should be taught to straddle the rail, and with the aid of the hands to swing over, pivoting upon the buttocks as they momentarily are in contact with the rail. The man swings either to the right or left as is easy and natural for him.

The *wall* is one of the difficult obstacles on many courses. Its height should be at least seven and not more than eight feet. A wall may be constructed by nailing two-inch planks on the approach side of poles set in the ground. If lighter than two-inch material is used on the face of the wall, the uprights should be of two-by-fours and placed no more than two feet apart. Assist ropes of one to two-inch manila rope may be added if desired. If used, these should be securely fastened at the top of the wall and should hang down about five feet. They may be knotted to enable the men to gain a better grip. One horizontal cleat about three feet from the base and in line with each rope will be of great assistance to beginners. After the men have become proficient in climbing over by means of the ropes and cleats, they should be required to negotiate the obstacle without these aids. The proper method of crossing the wall barrier without aids is for the man to approach the wall at a dog trot, jump forward and upward at the wall; place one foot against it as high as possible; seize the top with both hands; pull the body up assisted by pressure with the foot against the wall; swing the free leg, followed by the other, over the wall; and drop to the ground, facing the wall in order that his rifle and equipment will clear the wall. In dropping from the wall a grasp on the top of the wall is retained as long as possible in order to break the fall. Men should be trained in negotiating any obstacle involving a jump or drop, to land with the knees slightly bent in order to take up the shock. Heavy men may have difficulty with the wall due to the greater burden placed upon their arms. These men should use the ropes until their arm muscles become accustomed to the task.

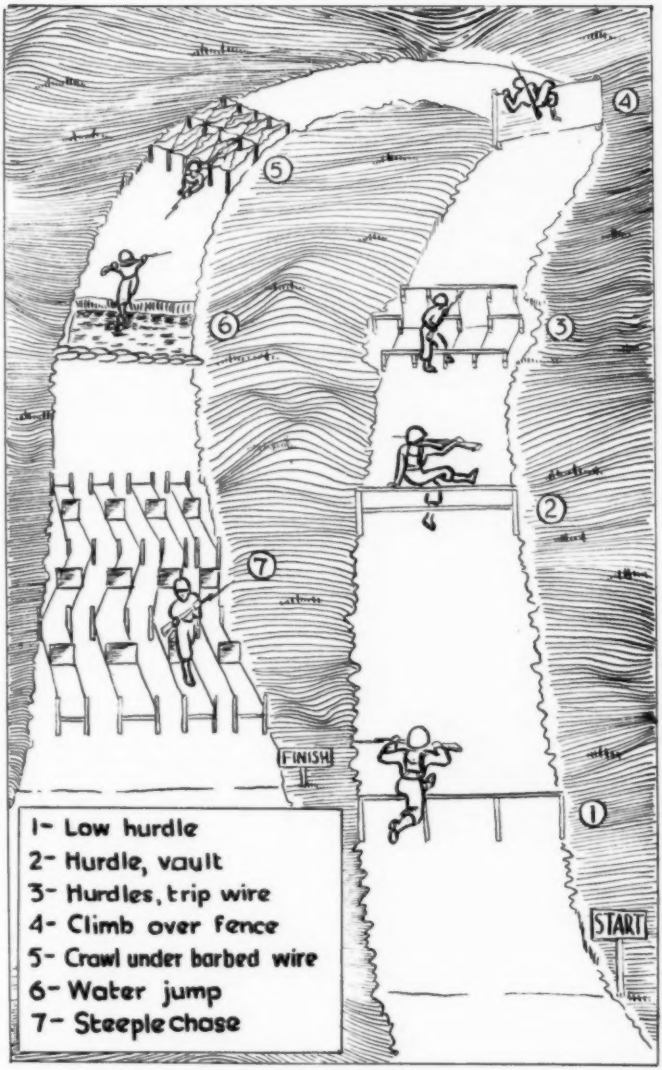


FIGURE 65.—Obstacle course of the 1st Student Training Regiment, The Infantry School.

As a variation, the wall obstacle may be crossed by squad teams as units in the manner of the ancient, but important military art of wall-scaling. In combat, situations may confront a squad where knowledge of cooperative, organized wall-scaling will be of great value; for example, a stone or brick barrier with a top too wide for good hand holds by the individual, or a wall ten to twelve feet high whose top cannot be reached by the hands.

A variant of the wall obstacle may be employed to give valuable instruction in one method of debarking from a transport and entering small craft for landing operations. For this purpose, a wall at least fifteen feet high should be constructed and a rope net of large mesh, to simulate a cargo net, suspended from the top so as to lie flat on both sides of the wall. In negotiating this obstacle men should be trained to grasp the net by the vertical ropes only; in order that in descending, hands will not be trampled.

Ditch and *trench* obstacles offer a wide variety of possibilities. They may be most difficult, or they may be made to appear difficult, yet in reality be easy of accomplishment. Wide or narrow, deep or shallow, dry or water-filled, ditches can be the most valuable barriers in the entire course, if they are properly constructed. The ditches may partake of the nature of an enemy trench or tank trap. Sandbags, wire, duck boards and mud should be included when constructing ditch barriers. This will increase interest and add realism to the course. A water-filled pit, two feet deep, at the bottom of the ditch, will afford an occasional moment of merriment when a company member takes an involuntary ducking.

Tunnel obstacles are valuable for teaching men to crawl properly. Locomotion on all-fours is man's most elementary method of movement, yet it presents a rather difficult problem to the average soldier. The greatest error observed is that most men do not keep low enough when crawling. Hence, the tunnel obstacle should be so constructed that a man must keep close to the ground in order to get through. An opening 30 inches high and 2 feet wide will just clear

the average man with field equipment. In some courses culvert pipes have been utilized for the tunnels. These are excellent, provided they are available, as they may be encountered in combat. Tunnels made of poles or salvage lumber are less expensive and will serve the purpose just as well as culvert pipes. In order to make the men crawl close to the ground, the instructor may use various devices; such as, strips of cloth soaked in wet whitewash and hung at intervals at the desired height from the tunnel floor. Men who do not keep low enough will emerge from the tunnel bearing the marks of whitewash. This, too, will add to the interest of the men. Cuts may be given each man for being marked by the whitewash strips.

Protruding nails or sticks are, obviously, a danger in any obstacle, and care should be exercised that they do not exist. The darkness inside a tunnel obstacle necessitates exceptional care in construction and maintenance that these hazards be avoided.

Ladder-type barriers, either vertical or horizontal, are included in most obstacle courses. Their chief value is that they develop coordination and a sense of balance. If practicable, rope ladders in combination with those made of wood should be used. Landing operations from transport ships or lighters may necessitate the use of rope ladders or rope nets by disembarking troops, hence the individual soldier should become proficient in ascending and descending them. The fear of height, which is present in some men, will be considerably lessened by constant practice on the ladder obstacle. In this connection the height from the base to the top or apex should be no more than 20 feet.

The horizontal ladder, similar to that found in most gymnasiums, is particularly valuable in strengthening the wrists of the participants.

The *maze* type obstacle teaches coordination of the eyes with the feet. Here, the man learns to make a rapid estimate and arrive at a quick decision as to how he is going to negotiate the maze. If practicable, the maze should be so constructed that, unknown to the men, additional wires may be added or removed to complicate the crossing of the obstacle.

The step hurdle is very adaptable for this purpose, and it will readily serve as a horizontal maze.

The vertical maze may be, simply, some posts, set in the ground at irregular intervals. The posts should be about 10 inches in diameter and 3 feet high. The intervals between posts should be rather narrow so that the man must carefully pick his way through and around them. The painting of the upper halves of all posts with whitewash, prior to the running of the course, will cause the men to travel the maze with care so as not to be marked.

Wire is of greater value as an adjunct to another obstacle, than when it is employed alone. Smooth wire may be used to dress up certain type barriers. Smooth-wire concertinas have been used as obstacles. However, such use is limited generally to a combination of the concertina with a fixed obstacle.

Barbed wire, used in connection with trenches and emplacements, will give a realistic effect to the obstacle. Barbed wire may be utilized as an obstacle in its own right in the form of a double-apron or single-apron fence. A wide strip of chicken netting may be laid over the barbed-wire obstacle, and the men required to cross over at a run. Obstacles in the form of wire entanglements give the men a foretaste of what they will encounter in combat.

The construction and maintenance of the obstacle course is an appropriate job for the ammunition and pioneer platoon as a part of its training schedule. Most phases of pioneer training can be taught during the building of the course. Felling trees, digging pits, laying wire, grading and leveling, revetment, rope splicing, and rough carpentry are all necessary operations in the laying out and installing of any obstacle course.

Maintenance of the obstacle course must be continuous, especially if it is in daily use. A run-down obstacle course is uninviting and in actual practice may have obstacles which, due to their worn-out condition, present little or no challenge to the men. The factor of safety must be considered especially in connection with high obstacles or ropes that may break. These must be kept in good repair.

Approaches, landing pits, and the ground around the obstacles should not be allowed to become worn down; but should be filled and raked prior to the use of the course by any group. Sandbags should be kept filled, and if necessary, they should be replaced. Boards, planks, and wooden rails should be nailed tightly to their frames or standards, and all wire, both smooth and barbed, should be frequently checked to insure its tautness.

The procedure upon arrival of a unit at the obstacle course should be somewhat as follows:

For initial instruction the group should be conducted to the various obstacles in turn. At each obstacle the proper method of negotiating it is explained and demonstrated in detail, with emphasis on the avoidance of injury on certain obstacles. In running the course, platoons and squads should be kept intact with one platoon only stationed at the starting point at a time. Each squad forms behind its squad leader in the assigned lane. The platoon leader then gives instructions as to how the course is to be run; for example, at a walk, stopping after each obstacle; at a dog trot, taking the entire course without halting; or at a run against time. For initial instruction, one man in each lane should be sent, at a walk, over the first obstacle, where he waits until all the men in his group are over. The platoon leader should observe the performance of each man and make such corrections as are needed. When all obstacles have been negotiated in this manner, the groups return to the starting point. If the course is clear, they then are sent over at a dog-trot without halting at any point.

This method will eliminate many of the injuries generally received when a unit marches up to a course, halts, and begins running over it pell-mell. Men who have difficulty with an obstacle should be placed to one side and given additional instruction by one of the noncommissioned officers.

All men should first complete the course without equipment or arms. Loose, comfortable clothing, such as coveralls, or fatigue clothing, is advisable. *Athletic supporters should be worn*, if available.

Scoring and timing are matters which the instructor can work out as the men attain proficiency. A system of rating, against time and each obstacle, will serve to heighten the competitive spirit. For example, each squad may be timed as a unit in its completion of all obstacles, and a record established. Other squads should then be encouraged to lower the record. Proper recognition will enliven interest and make a sporting event of training.

The completion of the course with full combat equipment and arms should be undertaken immediately after all have demonstrated that they can negotiate the obstacles. The procedure in this phase of the training should be the same as without arms and equipment. The men should first walk, and then go over the course at a slow run. Especial care must be taken that no man falls on his rifle. Rifles should be slung when crossing walls or any obstacle requiring the use of both hands, so as to leave the hands free. Ordinarily, bayonets should not be fixed—if they are fixed, scabbards should be used.

The value of music, as a stimulus to achievement of the difficult, should not be overlooked. Recorded martial music played in the immediate area while the men are running the course will give their achievement an added, emotional background. In many instances, men who are indifferent as to method and speed in surmounting obstacles will be spurred on to greater effort by the stirring notes of a march. The musical background idea can be well used as a graduation feature which will give the occasion some of the aspects of a field meet. Intra-company, battalion and regimental obstacle course contests, with selected teams participating against time, can be prepared by the officer who possesses energy and imagination.

In addition to using obstacle courses for the purpose of physical conditioning and for training in methods of passing obstacles which may be encountered in the field, obstacles may be combined with other forms of training. The bayonet qualification course, formerly prescribed for many years in the army, is one example of such use.

Figure 66 illustrates one of the many possible arrangements by means of which advanced training with grenades and the bayonet may be combined with additional practice in the passage of obstacles. Practice on such a course, particularly in the later stages, when it is run against time, provides not only a test of the soldier's endurance but also his ability to employ his weapons effectively during a period of extreme physical exertion.

Obstacles may also be effectively employed in connection with prepared tests of the soldier's individual training. Such a course must be set up especially for the test and should not be employed for regular training, since once the soldier has traversed the course, the element of surprise is lost. However, any regular obstacle course may be utilized for preparatory training for such a test by adding enemy snipers or other surprise elements to the regular course.

In the training test shown in Figures 68 and 69, obstacles are employed only as an incidental part of the test. The course is designed specifically as a test of the soldier's reaction time, his ability to think and act quickly, and his technical ability to use his three basic weapons effectively. However, in order to negotiate this or any other similar test course, the soldier must not only be able to use his weapons effectively and know their proper tactical employment, but he must also be able to negotiate obstacles automatically without fixing his attention on the obstacle. For example, if a man crossing a stream or gully on a log has his attention centered on negotiating the obstacle and is suddenly fired upon, he will be unable to react quickly and take proper offensive actions against his enemy. Figure 67 is a suggested score sheet suitable for grading men undergoing such a test.

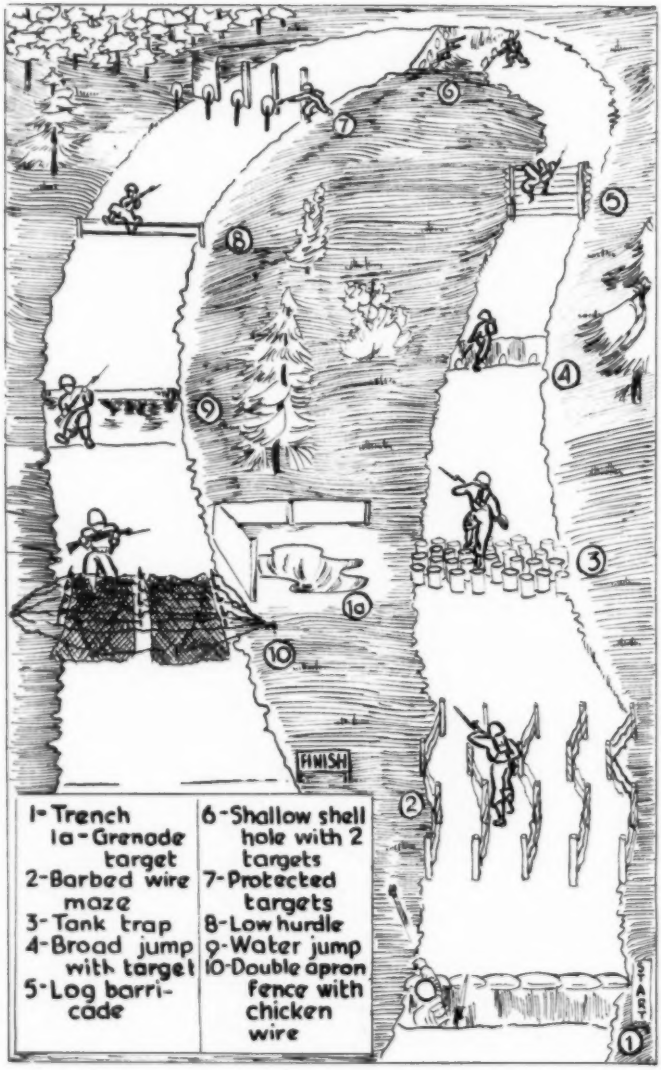


FIGURE 66.—A suggested obstacle course, including bayonet and hand grenade targets.

CHECK SHEET ON _____
(NAME OF SOLDIER)

✓ = CORRECT X = NEEDS ADDITIONAL TRAINING U = UNSATISFACTORY	A REACTION TIME	B CORRECT ACTION TAKEN	C SKILL IN USE OF WEAPON	D USE OF COVER AND CONCEALMENT	E SEARCH OF AREA	F AGGRESSIVENESS	FURTHER TRAINING NEEDED	CORRECT ACTION
STATION NO. 1.								FIRE FROM HIP RUSH
2.								STAB OR FIRE FROM HIP
3.								SEEK COVER AND FIRE
								COVER. SEARCH. FIRE

FIGURE 67.—Suggested score sheet for use in grading men undergoing individual training test.

Situations	*Solutions**
Station No.	
1. Receives fire from 1a.	Fire from hip. Rush for bayonet attack.
2. By means of a rope, attendant moves dummy lying in hole, so as to attract attention.	A quick bayonet attack.
3. Receives fire from 3a.	Finish crossing fence. Take proper cover. Return fire.
4. Receives fire from sniper in tree at 4a.	Take proper cover behind logs. Search from right end of logs for the sniper and return his fire.
5. Receives fire from 5a.	Fire from hip. Get out of wire. Take proper cover, ready to fire again if necessary.
6. Two silhouette targets operated from a safe distance by an attendant, appear momentarily over edge of trench.	Take proper cover. Throw grenade into trench.

* The solutions given are merely suggested solutions. The correct solution will vary depending upon the terrain upon which the test is conducted.

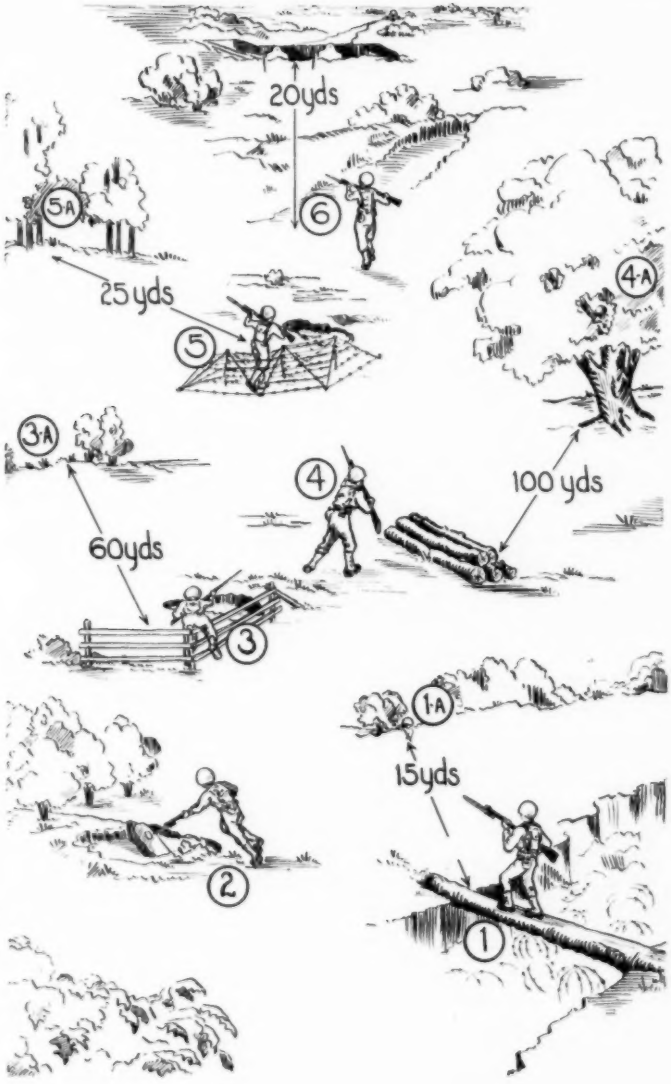


FIGURE 68.

Situations	*Solutions**
7. Enemy machine gunner, firing to a flank, apparently has not seen the man. Gun is fired by means of a rope which is pulled by an attendant.	Take proper cover. Throw grenade into emplacement.
8. Enemy rifleman fires and attempts to flee to the rear of the building. Second rifleman within the building remains quiet, firing only if the man being tested fails to take proper cover.	Fire at fleeing rifleman. Take proper cover. Crawl to within grenade range of building. Throw grenade into building before exposing himself.
9. Bayonet target with protruding parrystick is located at left of turn. Attendant rustles bushes to attract attention to target.	Approach turn cautiously. Parry the stick and thrust at the target.
10. Dummy hung from tree is swung into path.	Execute a quick buttstroke or bayonet thrust.
11. Receives fire from 11a.	Complete crossing of fence. Take proper cover. Search for enemy and return his fire.
12. Enemy rifleman rushes from 12a, shouting, "Halt."	Fire from hip. Take proper cover. Fire again if necessary.

* The solutions given are merely suggested solutions. The correct solution will vary depending upon the terrain upon which the test is conducted.

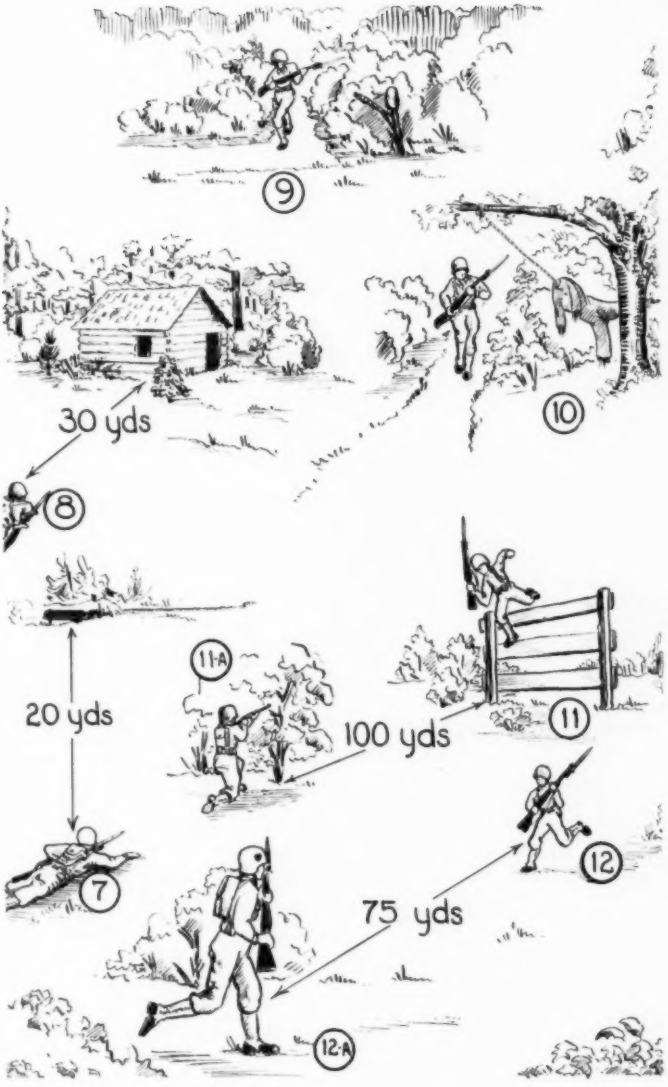


FIGURE 69.

Regardless of our great American heritage of valor and idealism, in order to meet the enemy on equal terms, we must be tough physically. The brawn developed by our training schedules must equal and overcome that created by years of hard, simple, servile living. There are no short-cuts to physical toughness. However, an obstacle course will help develop a physical condition that will prepare men adequately for the task toward which all training is directed—THE DEFEAT OF THE ENEMY.

CHAPTER 8

Troop Leading
A Battalion in Defense

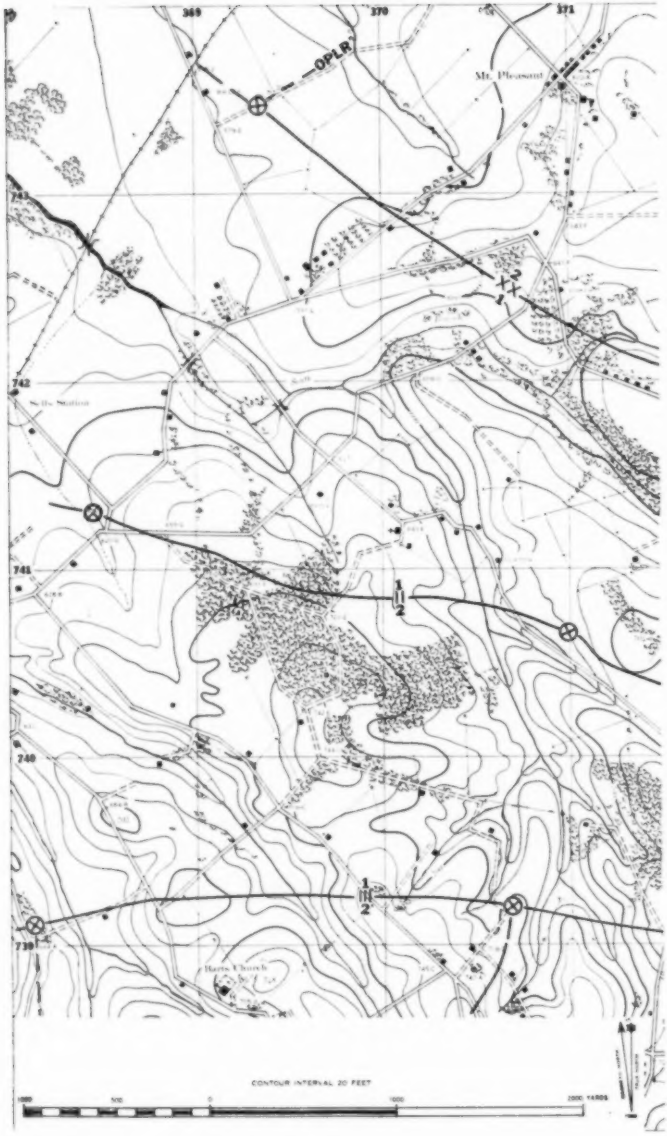
Troop leading is the art of leading troops in maneuver and battle. It comprises all the actions taken and the orders issued by a commander in any tactical situation. Good troop leading in any type of operation will result in all units arriving at the place at which it is desired they begin the accomplishment of their initial combat mission with a minimum of delay, and with the fullest available information of the situation and their intended part in the operation. Troop leading requires of the commander careful advance planning; rapid and efficient reconnaissance; judicious use of staff officers; the ability to make sound decisions rapidly; and the ability to make known those decisions by means of clear and concise orders. The best troop leading can attain its maximum results only if the command has reached a high state of training, morale and discipline.

The exercise which follows was designed to illustrate some of the problems involved in the occupation of a defensive position by an infantry battalion. The means and methods employed in the solution offered should not be accepted as a prescribed procedure; but rather as a suggestion of a possible solution upon which the reader may improve.

SITUATION

1. *a.* (1) The 1st Division, part of a larger force, is moving northwest by shuttling to the area southwest of Hanover, (four miles northeast of RJ 882 Figure 70),

NOTE: This problem is based upon Tables of Organization effective October 1, 1940.


369
370
371
OPLR
Mt. Pleasant
743
742
Mills Station
741
740
739
Harris Church
CONTOUR INTERVAL 20 FEET
1000
500
0
1000
2000 YARDS

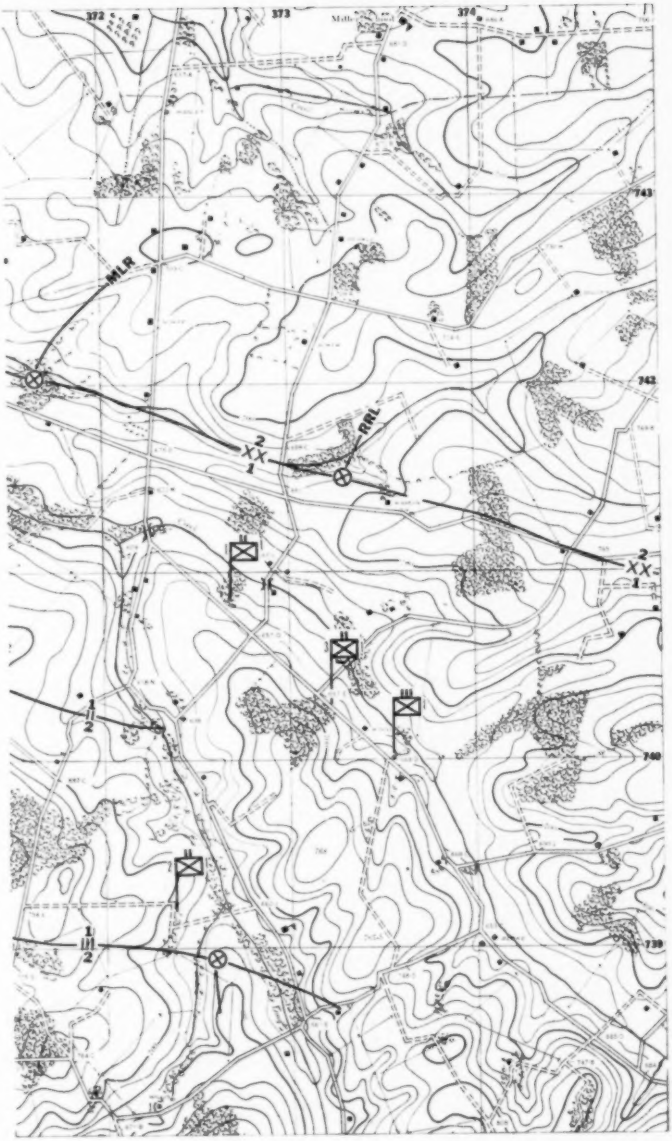


FIGURE 70.

under cover of friendly mechanized and motorized forces.

(2) The general tactical situation caused Colonel 1st Infantry to anticipate an order to defend. He formed his column accordingly. The first serial moved in the order: 1st Battalion, Headquarters Company, Antitank Company (less elements providing antimechanized defense), and 2d Battalion. Under the control of the regimental executive, the serial had been directed to detruck when the head of the column reached RJ 890-C (one-half mile southeast of RJ 882), and march on RJ 882 (77-38), with the 1st Battalion providing the advance guard. Battalion sections of the communication platoon and medical detachments have joined their respective battalions.

(3) Prior to the time the first serial passed the initial point, the regimental commander and certain of his staff departed to meet a representative of the division commander to receive further orders.

b. (1) The elements of the 1st Infantry which had moved in the first serial detrucked, formed march column and at 6:50 AM, 1, June, halted with the head of the main body at RJ 882 (77-38).

(2) Company A, with the 1st Platoon and one section 3d Platoon Company D attached, was marching as the advance guard for the regiment.

(3) The 1st Battalion, less elements in the advance guard, was at the head of the main body in the following order:

Headquarters Detachment, Company B, Company D (less 1st Platoon and one section 3d Platoon), Company C.

(4) Weapon carriers are moving at the tail of the serial. All except those of the advance guard are under regimental control.

(5) All command and reconnaissance trucks (command cars) and messenger vehicles are with their units in the column.

(6) The regimental executive, members of the command echelon of regimental headquarters (not accompanying

Colonel 1st Infantry), battalion commanders, Captain Headquarters Company, Lieutenant Second-in-Command Antitank Company, and their parties have been assembled at the head of the main body to receive orders from the regimental commander.

c. As the motor column was halted, S-1 met the regimental executive with a message from Colonel 1st Infantry. Lieutenant Colonel 1st Battalion heard the following instructions given to the regimental executive:

> A superior hostile force of all arms, supported by combat aviation, is advancing from the northwest. It is estimated that the main hostile force cannot attack this division prior to 3:00 PM today; however, enemy combat aviation and mechanized reconnaissance elements can attack the division at any time.
>
> This regiment is to defend the sector indicated on this operation map. (Figure 70). The regimental commander tentatively plans to defend the sector with the 1st and 2d Battalions in forward areas as indicated with the 1st Battalion on the right.
>
> The regimental commander directs that you have the battalions march on assembly positions in their respective areas and the headquarters and antitank companies move to the vicinity of RJ 669-D (73-40)—see *Road Sketch;* here are copies for Executive, each battalion commander, and S-4.
>
> Battalion commanders and S-4 are to meet the regimental commander on Hill *768* (73-39) for orders at 7:30 AM.

d. When S-1 had finished delivering this message, Lieutenant Colonel Regimental Executive issued the following instructions:

> "You have heard the regimental commander's orders. We will resume the march at 7:00 AM via RJ 883 (76-39) to RJ 668-C (73-39). Upon arrival thereat, approximately 8:00 AM, battalions and separate companies will be released to their commanders who will continue the march to assembly positions in the areas designated in the regimental commander's order. Trucks now moving under regimental control likewise will be released upon their arrival at that point."

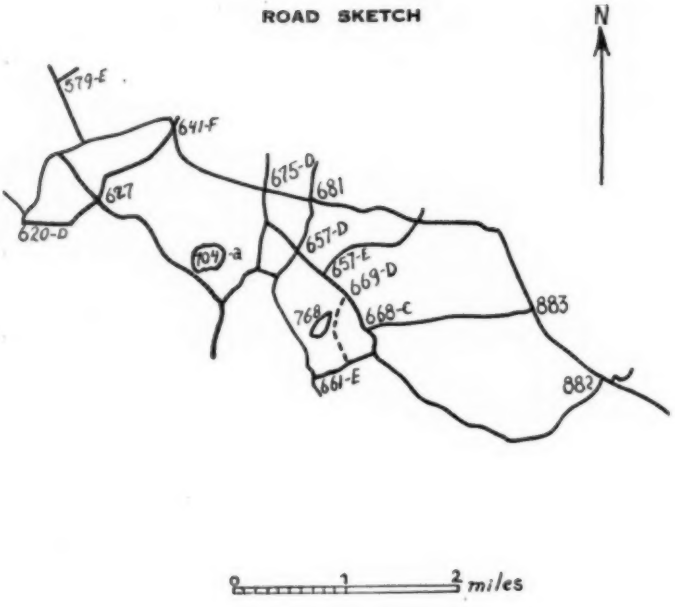


FIGURE 71.

e. While S-1 was delivering Colonel 1st Infantry's message, Lieutenant Colonel 1st Battalion was making notes and drawing in the data with reference to the regimental sector on his map.

FIRST REQUIREMENT

2. The actions taken and orders as actually issued by Lieutenant Colonel 1st Battalion from 6:55 AM until 7:30 AM, the time he reports to receive the regimental commander's order.

DISCUSSION

3. *DEFENSE POSITION.—a. Occupation of position.*— The method of occupation of a defensive position varies with the situation. Where conditions permit, troops are placed in a position of readiness with proper provision for security, pending the reconnaissance of the battalion commander. Necessity for immediate readiness for action may, however, require the prompt deployment of the troops and the occupation of positions on the basis of information immediately available. In such case, the battalion commander distributes the rifle companies to the combat echelon and the reserve, defines the general location of the main line of resistance, attaches a portion of the heavy machine guns to rifle companies, assigns missions to his antitank weapons, and assigns sectors of fire to the mortars and long-range missions to the heavy machine guns remaining under his control. In the continued occupation of the position, these initial measures are readjusted and expanded in accordance with the general procedure of more deliberately organized defense.

b. Reconnaissance.—Wherever practicable, the occupation of a defensive position is preceded by the personal reconnaissance of the battalion commander, accompanied by the artillery liaison officer, the commander of the heavy weapons company, and such other personnel as he may direct.

(1) The reconnaissance bears first upon the terrain of hostile approach. It seeks to determine—

(a) Areas which afford covered approach to the position or which could be used to screen the location of hostile reserves and supporting weapons.

(b) Obstacles and exposed stretches of terrain over which the enemy must pass, especially crests, edges of woods, village exits, and defiles.

(c) Commanding features of the terrain which may be expected to be occupied as hostile observation posts; and areas within the defensive position which would be exposed to hostile observation.

(d) Terrain features in the foreground which in friendly possession would screen important defensive areas from hostile observation, favor long-range fire action, and constitute the best available positions for security detachments.

(e) Defiladed areas where hostile forces might assemble for attack within the range of friendly supporting weapons.

(2) The detailed reconnaissance of the defensive position or area follows. It seeks to determine—

(a) Points from which observation of the foreground of the position can be most effectively carried out.

(b) Locations from which approaches to the position can be most effectively swept by frontal and flanking fire.

(c) Masks within the position which can be used to screen the location of reserves, the emplacements of antiaircraft and heavy weapons, and the approaches from the rear.

(d) Areas most menaced by probable avenues of hostile approach and fronts along which artificial obstacles to tank attack are most necessary.

(e) Areas especially vulnerable to gas concentrations. Following his reconnaissance, the battalion commander issues his order and establishes his detailed plans.

4. *BATTALION DEFENSE ORDER.* — The battalion order covers—*a*. Information relative to the enemy and friendly troops, including the mission of the regiment, units on the flanks of the battalion, covering forces, artillery, antitank, and aviation support.

b. General plan of defense; boundaries of battalion defense area; exact course of the main line of resistance; distribution of rifle units to combat echelon, reserve, and where necessary, the combat outpost; any attachments to the companies.

c. Defensive areas (boundaries) of rifle companies of the combat echelon; mission and location of reserve; departure positions for counterattack; positions for flank defense.

d. Missions and distribution of heavy machine guns; emplacements and target areas of battalion mortars; emplacements and sectors of fire of antitank weapons.

e. Security elements: location and mission of combat outposts and advance detachments.

f. Supply: location of battalion ammunition distributing point; aid station; arrangements for ammunition distribution, including amount to be dumped on the position if required; disposition of carriers and unit trains.

g. Communications: location of battalion command and observation posts and message center; telephone and radio, light wire local systems, panel stations and dropping grounds, signal light conventions.

5. *DISTRIBUTION OF TROOPS.—a.* The most usual distribution places two rifle companies in the combat echelon and one in reserve. Where, however, a portion of the battalion defense area is exposed to hostile observation and fire, such area may be left unoccupied and covered by fire from the occupied area, the heavy weapons, and the artillery. In this case distribution in depth (successive companies) is indicated.

b. The heavy machine guns are distributed for the execution of three missions:

(1) Long-range fire from positions other than those in the main line of resistance.

(2) Close defense of the main line of resistance by reciprocal flanking action, covering the front of the position by continuous interlocking bands of fire, in combination with the light machine guns.

(3) Rear defense of battalion area, stopping hostile elements which may have penetrated the main line of resistance. These guns may also deliver long-range fires in front of the position.

c. The battalion mortars occupy positions to the rear and usually within 500 yards of the main line of resistance. They are usually distributed over a depth of from 100 to 200

yards. Exceptionally, where the battalion occupies an extensive front or in close terrain where visibility is poor, mortars may be attached to rifle companies.

d. Battalion antitank weapons usually occupy positions covering the main line of resistance (and the position of the combat outpost, where established).

6. *SECURITY.*—The instructions of the battalion commander to the commander of the combat outpost cover—

a. Information relative to the enemy and friendly troops, especially as to any friendly troops operating in front of the outpost; artillery and heavy weapons support.

b. Position to be occupied by the outguards; any special patrols to be sent out.

c. Conduct in case of attack; method and time of withdrawal; action on completion of mission; antitank defense; long-range fires.

d. Communications; signal light conventions.

e. Administrative arrangements.

7. *FIRE PLAN.*—*a.* The battalion plan of fire includes—

(1) Long-range fires.—These are delivered by the outpost and elements attached thereto for long-range fires; and by machine guns firing from positions in rear of the main line of resistance. Machine guns firing from positions to the rear of the main line of resistance may, depending on range and the location of the several defensive elements, fire on areas in advance of the oupost, in the outpost position (after withdrawal of the outpost), and on the zone between the outpost and the battle position.

(2) Final protective fires.—At least one-half of the heavy machine guns are assigned to positions and fire missions on the main line of resistance. Their fires are combined with those of the rifle company light machine guns so as to cover the front with continuous bands of flanking fire.

(3) Antitank fires.

b. The most urgent missions in the main line of resistance are satisfied first and fires within the position last.

Portions of the plan are established concurrently by different agencies. Minor alterations of the orginal arrangements are frequently necessary.

c. The conditions under which the various fires are to be delivered, including the signals for prearranged fires, their duration, the method of obtaining their repetition or continuance, the persons authorized to call for them, the units responsible for their delivery, and the areas automatically affected by calls for the various fires, are especially prescribed in the fire plan. Where practicable, fires are registered.

8. *RESERVE COMPANY.*—*a.* The missions assigned to a reserve company vary with the nature of the terrain of the defensive position and the situation. According to circumstances, a reserve company may be employed—

(1) As a mobile unit for counterattack against hostile elements penetrating the battalion defense area; or for the occupation of provisional flank positions in case of hostile penetration of an adjacent sector.

(2) As a holding force, extending in depth the zone of resistance constituted by the front-line companies.

b. The battalion commander fixes the location of a company held in mobile reserve. He designates provisional departure positions for counterattack against hostile elements penetrating the battalion area and flank lines of resistance to be occupied in case of penetration of an adjacent sector.

(1) The position of the battalion reserve is frequently in proximity to the position of regimental antitank guns supporting the battalion. Where this is the case, provision should be made for coordinating the dispositions and plans of the reserve with the contemplated antitank action. Protection of the antitank guns against hostile infantry may automatically result where a reserve company extends in depth the dispositions of the combat echelon. A reserve company held mobile for counterattack should, where feasible, occupy departure positions naturally impracticable for tank movement or rendered so by artificial means. The

counterattack is launched, after the passage of hostile tanks, against the hostile infantry following.

(2) The battalion commander prepares the heavy weapons fire support of counterattacks. Heavy machine guns assigned as break-through guns and mortars in rearward positions establish a supporting fire base. Forward mortars, where practicable, continue on their assigned fire missions in front of the main line of resistance, taking rearward enemy elements under fire. The weapons platoon of the reserve company reinforces the heavy weapons fires.

(3) The reserve company does not ordinarily move into an adjacent sector to counterattack hostile elements penetrating that sector. In this situation it seeks to protect the battalion area from being rolled up from a flank by occupation of a position blocking off the penetrating elements.

(4) The battalion commander prescribes the location of flank lines of resistance and the works to be executed. He also frequently details working parties from the reserve to reinforce the combat echelon in the initial stages of the ground organization of the position. Where a battalion combat outpost is necessary, he usually details a platoon of the reserve company to constitute the outpost. Where the position is occupied for more than one day, provision for relief is made.

(5) The antiaircraft protection of the battalion reserve is provided by the heavy machine guns in rear positions, (break-through guns) and the weapons of the reserve company.

9. *BATTALION ANTITANK PLATOON.*—The antitank platoon is included in the composition of the heavy weapons company for the purpose of supply, administration, and technical training only. The tactical missions of the antitank platoon are assigned by the battalion commander and are executed under his immediate direction or that of the commander of the unit at whose disposition it may be placed by the battalion commander.

A SOLUTION TO FIRST REQUIREMENT

10.—*a.* At 6:55 AM, at the conclusion of the regimental executive's instructions, Lieutenant Colonel 1st Battalion issued the following oral instructions to Major Executive and S-3:

"When the battalion is released from regimental control, take command and continue the march on RJ 609 (72-41); a staff officer or messenger will meet you en route with further orders. Leave a guide at RJ 668-C (73-39) with instructions for Lieutenant Transport Officer to conduct the motors to RJ 609 where they will be released to companies. I am taking Lieutenant S-1 and S-2, Lieutenant S-4, Battalion Sergeant Major, Corporal Clerk, one SCR-195 radio and operator, one messenger, one command car, and one ¼-ton liaison truck from Battalion Headquarters Detachment with me. I also want Captain Company D and Lieutenant Antitank Platoon in their command cars to accompany me. Have this party assembled here at once."

b. (1) Lieutenant Colonel 1st Battalion then studied his map, tentatively selected an assembly area for the battalion, planned his route to Hill *768* (73-39) so as to see as much of his area as possible.

(2) At 7:05 AM he proceeded with his party via RJ 883 (76-39) and RJ 668-C (73-39) to RJ 669-D (73-40). Here he paused briefly to identify and point out to his party the location where the regimental command post is to be established. Proceeding to RJ 609 (72-41) he again paused to identify his position and to orient himself and the members of his party. He then continued past RJ 638 (72-40) to the road junction at (72.6-39.8), thence east to the end of the unimproved road and southeast cross country to Hill *768*.

(3) The enlisted men and vehicles were sent to concealed positions in the woods on the eastern slope of that hill.

A DISCUSSION OF FIRST REQUIREMENT

11.—*a.* (1) The formation in which the 1st Battalion 1st Infantry is marching and the presence of the battalion commanders and various regimental and battalion staff officers,

at the head of the main body when the column halted at RJ 882, was the result of advance planning and active troop leading. Troop columns must be so disposed as to provide adequate security against aircraft and hostile mechanized attack.

(2) Before leaving the regiment to go forward to meet a representative of the division commander, Colonel 1st Infantry advised his executive of his destination and his instructions, and directed that the troops be marched to a definite point and await orders.

(3) The executive should assemble battalion commanders and staff officers at the head of the main body in order that there be no delay in the transmission or execution of orders.

b. Having heard the instructions of Colonel 1st Infantry delivered by S-1 and having received the further orders of the executive, Lieutenant Colonel 1st Battalion had three decisions to make without delay. They were, namely:

(1) The manner of control of the further march of the battalion when released to battalion control at RJ 668-C and the objective to be assigned.

(2) What personnel and transportation he would take forward with him when he left to receive the regimental commander's order.

(3) The route he would take forward to meet the regimental commander.

c. (1) Whenever the battalion commander is absent from his command post, the second-in-command, Major Executive and S-3, should be present. This principle of command answers the first part of the first decision, namely, Major Executive and S-3 should be directed to conduct the remainder of the march of the battalion.

(2) Lieutenant Colonel 1st Battalion might have selected assembly areas by examining his map and thus the companies could have been ordered to move directly to their particular areas. However, areas selected solely by a perusal of the map often will be found entirely unsuitable. Instead the use of a march objective for the battalion permits the selection of assembly areas on the ground after some

reconnaissance and after the receipt of additional information which often enables the commander to direct the march of the companies on areas in the immediate vicinity of their future employment.

d. There are available in the battalion headquarters detachment two command cars and two ¼-ton liaison trucks. When the battalion commander goes forward on reconnaissance or to receive orders, he uses his command car and takes certain individuals with him. In principle, all members of the staff whose presence may be of help to the commander on his reconnaissance should be taken. Since both Captain Company D and Lieutenant Antitank Platoon are provided with command cars, there is ample transportation to take the selected party and still leave transportation for the use of Major Executive and S-3.

e. When the battalion commander and his party move out in front of the column, measures must be taken to provide for their security. In this situation motor transportation is not available to provide a motorized patrol for this purpose. However, by extending the distance between vehicles when en route, and by posting drivers and other enlisted men of the party in observation when halted, a reasonable degree of security for the party can be provided.

f. There are numerous roads leading to Hill *768* which fulfill the primary requirement that he reach that point by 7:30 AM. The route selected permits Lieutenant Colonel 1st Battalion to pass the location where the regimental command post is to be established, and at the same time permits him to make some personal reconnaissance of the area which his battalion is to defend. Particularly, he is able to see the nature of the cover available in the area for use as assembly positions.

SITUATION CONTINUED

12. At 7:30 AM Lieutenant Colonel 1st Battalion, the other battalion commanders including (Lieutenant Colonel 1st Field Artillery and two artillery liaison officers), and members of the regimental staff were on Hill *768* (73-39).

Certain staff officers and members of his Battalion Headquarters Detachment had accompanied Lieutenant Colonel 1st Battalion. As the battalion commanders and their parties arrived, they were oriented as to the terrain by a regimental staff officer. Motor transportation and the enlisted men of the several parties were under cover in the woods 100 yards east of the hill. After an oral analysis of the terrain from the enemy's viewpoint by the regimental S-2, operation overlays were distributed (Figure 70) and Colonel 1st Infantry issued his oral order, extracts of which follow:

There is no additional information of the enemy.

For main line of resistance, outpost line, and boundaries—see overlay.

1st Battalion organize and defend right forward battalion area. Coordinate fires with 2d Division on right.

2d Battalion, organize and defend left forward battalion area. Coordinate fires with 2d Infantry on left.

3d Battalion, in regimental reserve * * *.

Two normal barrages are allotted to the 1st Battalion and one to the 2d Battalion.

One platoon antitank company will be emplaced in each forward battalion defense area under regimental control.

Front-line battalions will establish combat outposts immediately upon arrival on the position. Outposts will hold until forced to withdraw.

Priority in the plan of construction of the position will be as follows: Location of combat emplacements, clearing fields of fire, construction of individual entrenchments and emplacements for supporting weapons, and construction of obstacles. Works will be camouflaged as they progress. Initial terrain program will be completed by 3:00 PM today.

Three truck loads of antitank mines are allotted to the 1st Battalion. They will be delivered on the position by 9:00 AM.

One battalion set of engineer intrenching tools will be available to each front-line battalion at RJ 669-D (73-40) at 8:30 AM.

Command Posts—see overlay.

It is now 7:40 AM.

SECOND REQUIREMENT

13. Actions taken and orders as actually issued by Lieutenant Colonel 1st Battalion, from the receipt of the regimental commander's order (7:40 AM) until he is ready to issue his battalion order for the defense.

A SOLUTION TO SECOND REQUIREMENT

14.—*a.* (1) Immediately upon completion of the regimental defense order, Lieutenant Colonel 1st Battalion contacted Lieutenant Colonel 1st Field Artillery Battalion and arranged for Lieutenant Artillery Liaison Officer to accompany him on his reconnaissance.

(2) He then contacted Lieutenant Colonel 2d Battalion and arranged for the mutual exchange of fires of a section of light machine-guns across the boundary between battalions.

b. Lieutenant Colonel 1st Battalion then studied his map and formed a tentative plan of defense of his area.

c. Lieutenant Colonel 1st Battalion then gave the following instructions to Lieutenant S-1 and S-2:

(1) Take notes and mark these points on your sketch.

(2) Take the ¼-ton liaison truck and Corporal Clerk, go to RJ 669 and then back along the route of march of the battalion. When you meet Major Executive and S-3, acquaint him with the situation and give him the following instructions:

> The battalion defense area will be defended with Companies A and B in the forward areas and Company C in reserve.
>
> The march will be continued with the following objectives—
>
> Company A—CR 675-D (72-41);
>
> Company B—the woods on Hill *704-a*; and
>
> Company C, less one platoon,—the woods northwest of CR 657-D (72-40).
>
> Company D will assemble under cover of *South Branch Conewago Creek* west of RJ 609.
>
> One platoon of Company C with the light machine-gun section attached will outpost the battalion area; it

will continue the march to the vicinity of CR 627 (69-41) and outpost the line from RJ 579-E (69-43) to RJ 620-0 (68-41), both inclusive.

The battalion command post will be established in the southern edge of the woods 200 yards northwest of CR 657-D.

Instruct Battalion Surgeon to make his reconnaissance and report at the northwest corner of the woods on Hill *704-a* with his recommendations at 8:25 AM. Have the rifle company commanders and the lieutenants of the heavy machine-gun and 81-mm mortar platoons assembled.

(3) When these officers have been assembled, you will guide them to the northwest corner of the woods on Hill *704-a* in the command cars of the heavy weapons company platoons.

(4) I plan to issue my orders at 8:30 AM.

d. Turning to S-4, Lieutenant Colonel 1st Battalion issued the following instructions:

Contact S-4 1st Infantry and arrange to have the three trucks of antitank mines report at RJ 609. At the same time, make the necessary arrangements to have the battalion ammunition train report at the same place upon its arrival and secure information as to when and where additional ammunition will be available.

Then you will go to RJ 669-D and obtain the tool truck allotted to this battalion; dump one-third of the tools at each of the following places: at the south edge of the woods 200 yards northwest of CR 657-D; at house at (71.7-41.8); and at the house at end of the unimproved road 400 yards north of Hill *704-a*.

e. (1) Lieutenant Colonel 1st Battalion then selected a route for his ground reconnaissance; he then started on his reconnaissance with Battalion Sergeant Major and a messenger in his command car, accompanied by Lieutenant Artillery Liaison Officer, Captain Company D, and Lieutenant Antitank Platoon and their parties in their command cars.

(2) (a) He travelled northwest to the end of the unimproved road and thence via RJ 618-N (72-40)—697-C

(71-39)—to the church at RJ 643-E (70-41); en route he paused briefly to identify and point out to his party the limiting point on the boundary between battalions.

(b) He stopped at RJ 643-E and looked back at the position. Then he went to CR 627 (69-41) where he again stopped for an examination of the terrain, observing particularly the cover and defilade available to the enemy and the nature of approaches to his area.

(c) From CR 627 he went to CR 641-F (70-42), turned to the southeast and followed the road back to his own area. As he went along the road toward CR 675-D, he paused to identify the limiting points on the main line of resistance and the division boundary; also he examined the stream lines and wooded areas on both sides of the nose in the right of the battalion area and considered methods of employing supporting fires against these avenues of approach.

(d) At CR 675-D he turned south and at RJ 622-M (72-41) he turned to the west on the unimproved road and went via the house at the end of the road to the northwest edge of the woods on Hill *704-a*, arriving there at 8:20 AM.

f. (1) During his reconnaissance Lieutenant Colonel 1st Battalion discussed with Lieutenant Artillery Liaison Officer the matter of artillery concentrations, the location of the normal barrages allotted to the battalion, and with Captain Company D, the proposed employment of the heavy machine guns and of the 81-mm mortars.

(2) (a) Upon arrival at the edge of the woods where he is to issue his defense order, the final adjustments were made in his plan for the employment of these weapons, and Captain Company D was released.

(b) At the same time the tentative plans for the employment of the battalion antitank platoon were discussed; a final plan was approved; and Lieutenant Antitank Platoon was released to emplace the guns and coordinate the antitank defense with Captain Antitank Company.

(c) Lieutenant Colonel 1st Battalion then prepared notes for his use in issuing his order.

g. At 8:30 AM, the officers who are to hear the battalion defense order having assembled, Lieutenant Colonel 1st Battalion oriented them as to the terrain, acquainted them with the situation, and issued his oral defense order.

A DISCUSSION OF SECOND REQUIREMENT

15.—*a.* As soon as Lieutenant Colonel 1st Battalion receives the regimental order, there are five things he should do without delay, namely:

(1) Contact certain commanders now present who will later be difficult to find.

(2) Make a tentative plan for the defense and select a route for his reconnaissance and the point at which he is to issue his defense order.

(3) Arrange to have his unit commanders precede the troops to receive the battalion order.

(4) Keep the troops moving toward the position.

(5) Initiate steps which will keep the administrative and supply arrangements for the defense abreast of the occupation of the position.

b. The presence of his artillery liaison officer with him on reconnaissance will assist greatly in the formation of the plan of defensive fires. Likewise the exchange of fires across the boundary with the 2d Battalion on the left can be arranged quickly by a personal conference at this time.

c. From a study of his map, together with the knowledge gained on his reconnaissance en route to receive the regimental order, Lieutenant Colonel 1st Battalion can decide finally that two companies are required to organize and defend the main line of resistance. From his knowledge of the march formation of the battalion he is able to make his decision as to the general assignment of companies and to indicate definite march objectives for them.

d. The detailed disposition of the platoons of Company D cannot be determined prior to his reconnaissance. This company is, therefore, directed to move to a concealed location in a centrally located area.

e. The point selected for issuing orders should be one that will give greatest observation over the area the battalion is to defend—particularly the main line of resistance, the keypoints within the area, and the most dangerous avenues of hostile approach. A point near the northwestern edge of the woods on the forward slope of Hill *704-a* meets these conditions. In getting his unit commanders forward prior to the arrival of the troops, Lieutenant Colonel 1st Battalion takes advantage of the motor transportation of the heavy weapons company to expedite their arrival.

f. Instructions are given for the early establishment of the battalion command post so as to insure contact with regimental headquarters and with companies of the 1st Battalion.

g. During his absence, Lieutenant Colonel 1st Battalion controls the battalion by messages and through staff liaison. In this situation, the instructions are too lengthy to be incorporated in a written message, or for transmission by radio. Lieutenant S-1 and S-2, Lieutenant S-4, and Lieutenant Antitank Platoon are available to Lieutenant Colonel 1st Battalion as staff messengers. Both S-4 and Lieutenant Antitank Platoon are required elsewhere on missions directly concerned with their specific duties; therefore, Lieutenant S-1 and S-2 is selected to carry the orders to Major Executive and S-3.

h. The early arrival of the antitank mines, the engineer intrenching tools, and the ammunition for stocking the defensive position and the distribution thereon are matters that are of immediate concern of the battalion commander; and he, therefore, directs S-4 to assist him in these matters as indicated above.

i. Lieutenant Colonel 1st Battalion plans his reconnaissance so that he will be able to see the keypoints in the battalion area as well as the terrain in front of the battle position. His route gives him an opportunity to study the terrain from the viewpoint of the enemy as well as to see the terrain on which the outpost is to be established. He studies the avenues of hostile approach in the northern part of the

area in order to formulate a plan of fires to block these approaches. Before going to the point where he is to issue his defense order, he looks over the key terrain feature in the right company area and decides upon the boundary between front-line companies.

j. Since the only map available to company commanders in this situation would be a small scale map, an operations overlay would be of little or no value. From the position from which his orders are issued, Lieutenant Colonel 1st Battalion can point out on the ground the boundaries and the main line of resistance together with limiting points thereon. As soon as possible, Staff Sergeant Draftsman should prepare a large scale sketch for use in showing plans for fire and defensive organization.

CHAPTER 9

The Infantry Digs In

Successful accomplishment of any military undertaking is largely dependent upon the proper protection of men, weapons, and equipment. Never before in the history of warfare has the necessity for constant protection of individual men been so important. In the words of Brigadier Pienaar of the First South African Brigade—"We dig in when we stop. I do not care how many unused holes we leave behind, but I never want to lose a man for lack of a hole dug."

As the magnifying glass focuses the rays of the sun on one small spot, likewise all energy expended in the training of the soldier is concentrated on the one objective—the placing on the battlefield of an instrument which will destroy the enemy. It is therefore incumbent on the *individual soldier* to adopt any and all measures which tend to prevent the destruction of himself and his weapon. Should he become a casualty his team not only loses his active aid, but his care and evacuation immediately become a burden.

The means by which a command protects itself against hostile fire have many characteristics in common, no matter what the type of operation. The essential elements of any plan involve proper security measures, fortifications, camouflage, selection of positions for individual men. Because these cardinal principles are so elemental we are prone to give them too scant attention on the assumption that we already know them. But they are sufficiently numerous that failure to impress them on our minds may result later in the loss of men and weapons, and in the failure of our mission.

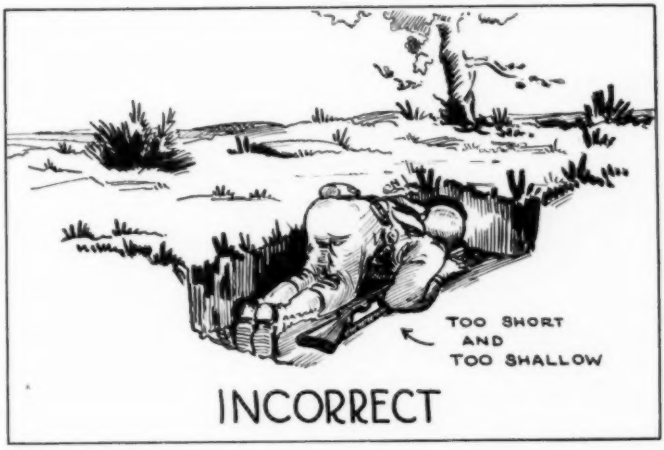
Unquestionably "digging in" is hard physical work, but the men can be made to see the point, if it is impressed upon them that the manual labor each man performs produces a shelter for *himself* and *his* weapon, which greatly increases *his* chances of escaping injury. Thus all his previous training is brought to fruition.

In this connection, the necessity for hardening the American soldier, physically and mentally, to the point where he is the equal or superior of any soldier in the world has been emphasized in training directives of the Commanding General, Army Ground Forces. Physical and mental conditioning and training and the construction of shelters can therefore go hand-in-hand.

It is the purpose of this article to illustrate correct and incorrect methods of locating and preparing protection for the individual, various weapons, and equipment of the Infantry.

1. *PRINCIPLES OF PROTECTION.—a. Individual.—*(1) Individual protection should be sought and improved, or excavated whenever troops are halted in a combat zone. When the halt is expected to be brief, troops should take advantage of such natural protection as is afforded by the terrain (for example; ditches or folds of the ground).

When the halt is to be for a longer period but less than six hours, (for example, a halt in an assembly area) individual prone shelters should be constructed. Full advantage should be taken of natural cover in the construction of these shelters. All personnel should be impressed with the fact that reasonable protection from air attack, artillery fragments, and small arms fire *can* be assured by this type of shelter. It does not provide as effective protection as the standing type one-man foxhole, but it permits the man to receive rest and protection simultaneously and can be dug quickly.


TOO SHORT
AND
TOO SHALLOW
INCORRECT

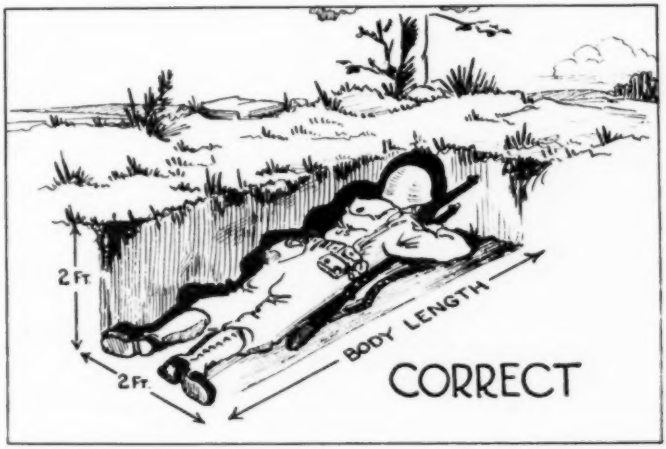

2 FT.
2 FT.
BODY LENGTH
CORRECT

FIGURE 72.

(2) When the duration of the halt may be more than six hours or the tactical situation indicates, standing type one-man foxholes should be dug. Men should occupy these foxholes only when an attack is in progress or imminent. Standing type one-man foxholes protect the occupant against the crushing action of tanks and against shell or bomb fragments and small-arms fire.

(3) Standing type double (two-man) foxholes or slit trenches may be constructed. This type affords slightly less protection than the one-man foxhole against bomb or shell fragments but is equally effective against small-arms fire. It furnishes much less protection against the crushing action of tanks. It is more conspicuous to air observers than the one-man type. It tends to increase the combat effectiveness of the troops by providing fighting comradeship. This type is particularly suitable for occupancy by an automatic rifleman and his assistant or for other missions requiring men to act in pairs.

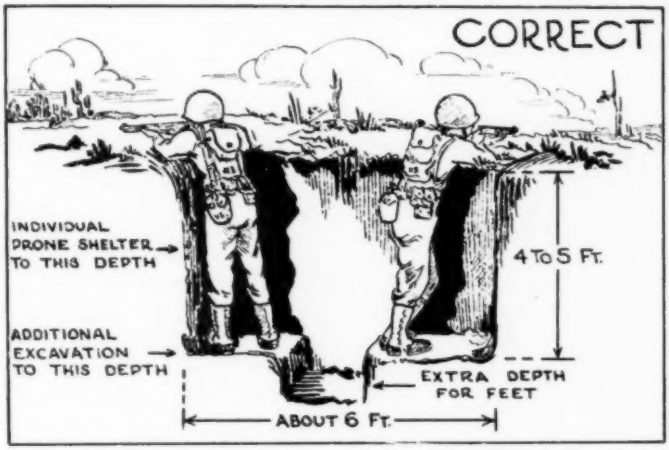


FIGURE 73.

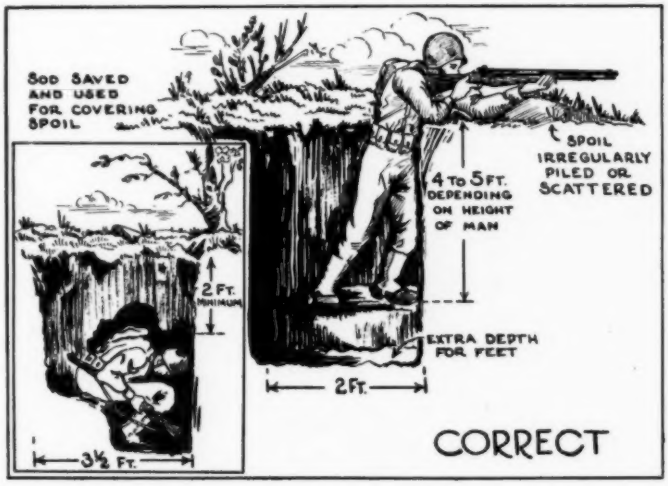


FIGURE 74.

Since the observation post is the seeing-eye for its unit, it is a remunerative target for the enemy. Hostile tanks will try to locate and overrun the observation post in order to "blind" the command. Whenever possible, observers should be placed in standing type one-man foxholes within voice range of each other.

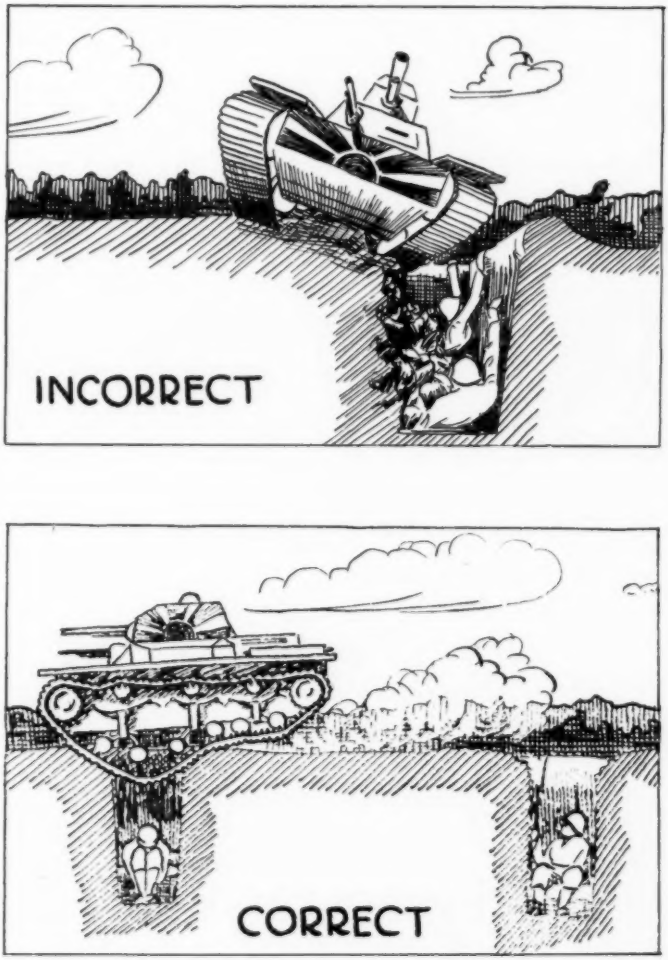


FIGURE 75.

b. Equipment.—The necessity for intrenchment to protect against attack extends, not only to every officer and man within the unit; it is essential, also, that this protection be provided for equipment at command posts, supply installations, etc. The standing type one-man or double foxholes can be utilized to furnish protection for certain types of equipment.

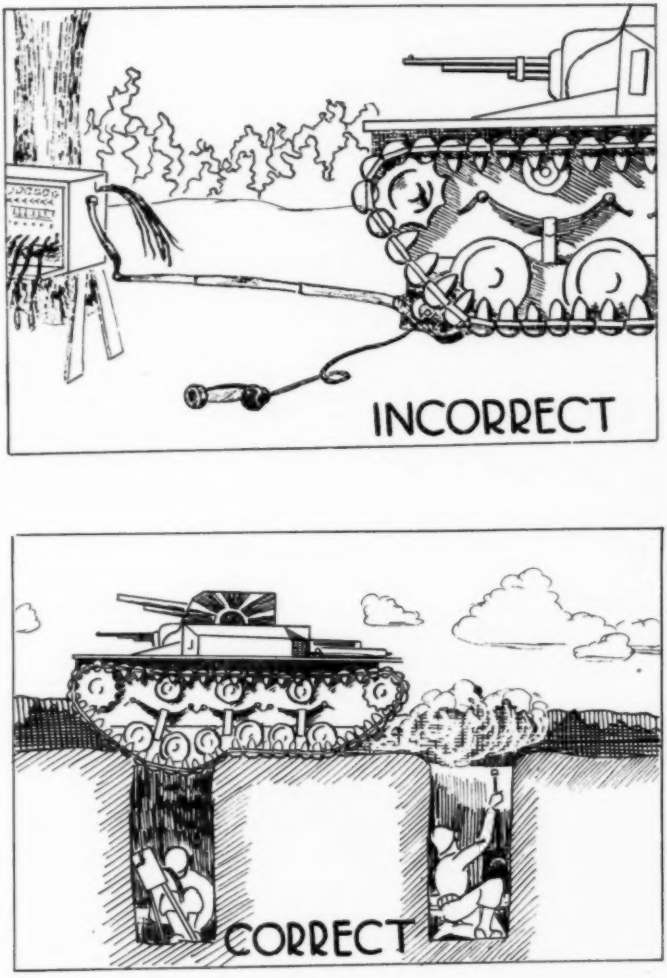
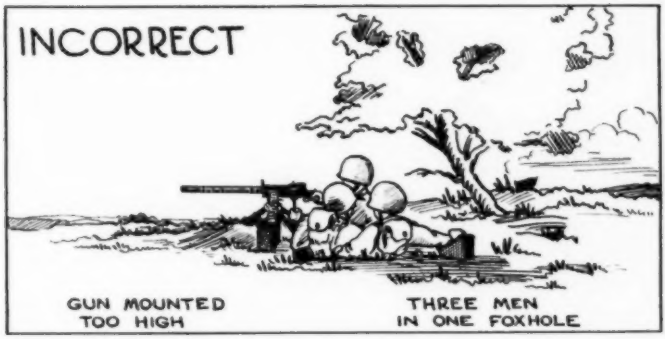


FIGURE 76.

c. Weapons.—(1) *Light machine guns.*—(a) Three standing type one-man foxholes for members of the crew. This type permits operation of the weapon and affords the protection of the one-man type foxhole. This type can also be used for a heavy machine gun.


INCORRECT
GUN MOUNTED
TOO HIGH
THREE MEN
IN ONE FOXHOLE

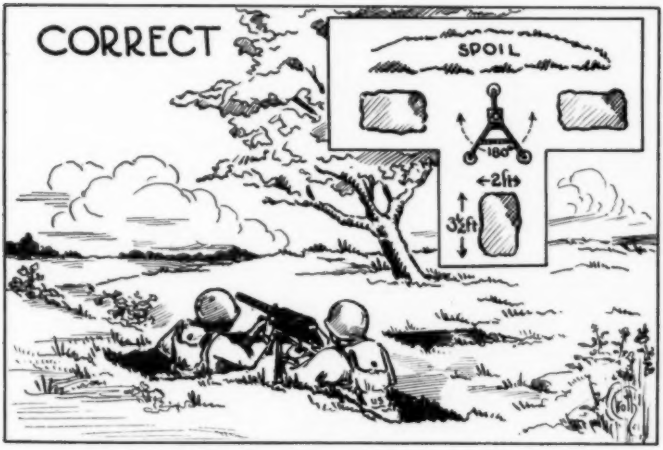
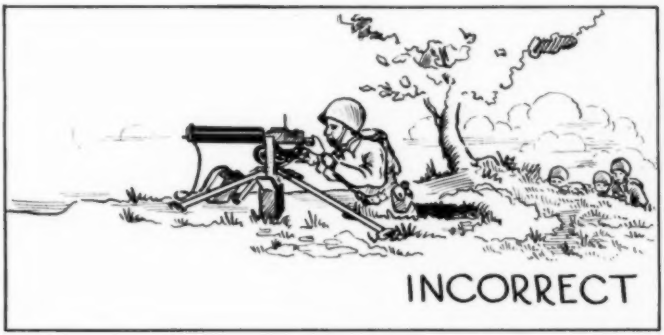

CORRECT
SPOIL
180°
2ft
3½ft

FIGURE 77.

(b) An open, standing emplacement furnishes protection against small-arms fire and bomb and shell fragments but affords less protection against the crushing effect of tanks which may destroy the gun platform. When this type is used, crew members should construct standing type, one-man foxholes nearby. This type is illustrated for the heavy machine gun.

(2) *Heavy machine guns*—An emplacement with three standing type one-man foxholes around the gun position permits operation of the weapon and affords protection to the crew. The tripod is reversed to permit the gunner to stand close to the gun. The gunner occupies the foxhole behind the gun. The foxhole to the right is ordinarily unoccupied except when the gun fires to its left flank, and the gunner and his assistant shift their positions to the right. This type is illustrated for the light machine gun.


INCORRECT

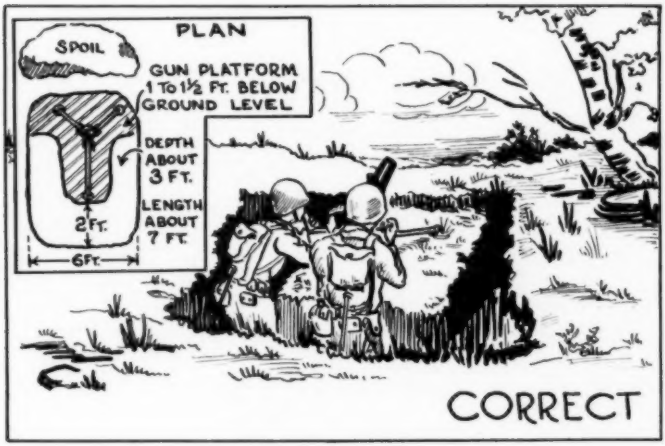

PLAN
SPOIL
GUN PLATFORM
1 TO 1½ FT. BELOW
GROUND LEVEL
DEPTH
ABOUT
3 FT.
LENGTH
ABOUT
7 FT.
2 FT.
6 FT.
CORRECT

FIGURE 78.

(3) *60-mm mortar*—(a) Standing type, one-man foxholes for each member of the crew permit operation of the weapon and afford the protection of the one-man type foxhole.

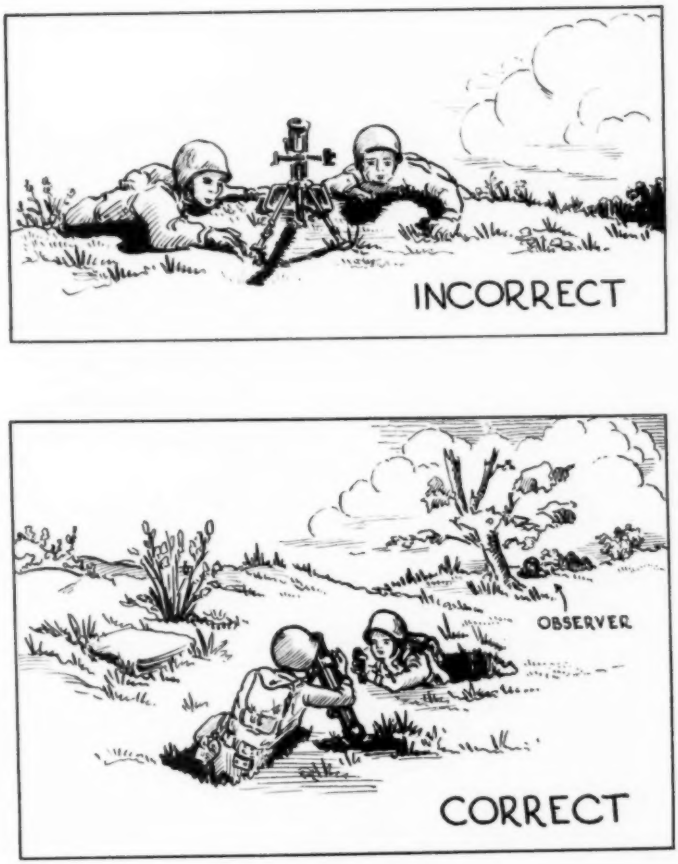


FIGURE 79.

(b) A single emplacement for mortar and crew is used for protection against bomb or shell (mortar and artillery) fragments as well as small-arms fire. However, it should be supplemented by nearby standing type foxholes for the use of the crew in case of a tank attack. This type is not suitable unless the observer's position is close enough to the gun to permit him to communicate with the crew by voice.

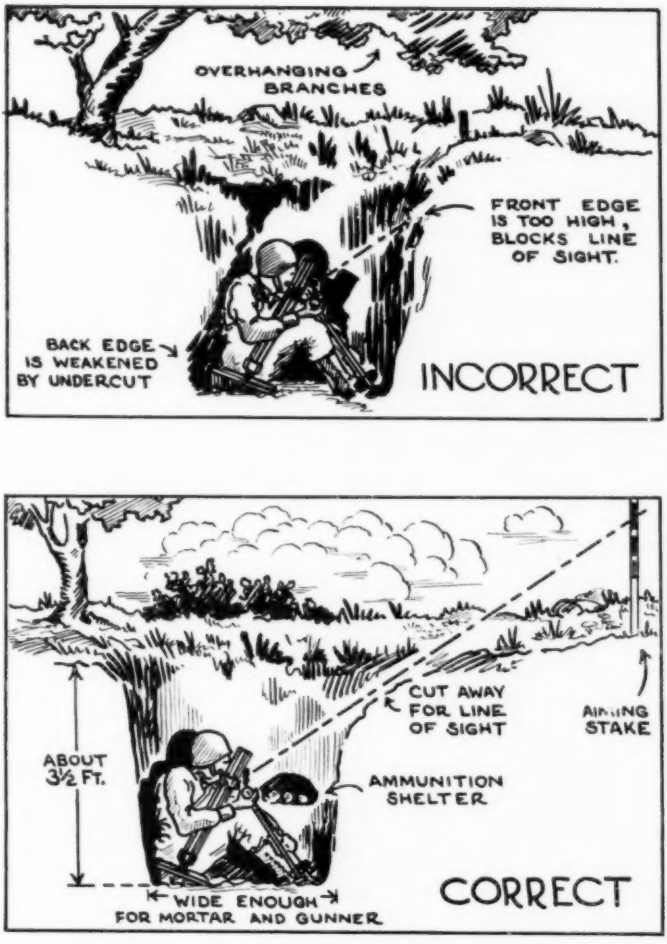

OVERHANGING BRANCHES
FRONT EDGE IS TOO HIGH, BLOCKS LINE OF SIGHT.
BACK EDGE IS WEAKENED BY UNDERCUT
INCORRECT
CUT AWAY FOR LINE OF SIGHT
AIMING STAKE
ABOUT 3½ FT.
AMMUNITION SHELTER
WIDE ENOUGH FOR MORTAR AND GUNNER
CORRECT

FIGURE 80.

(4) *81-mm mortar*—The emplacement for the 81-mm mortar consists of a pit which is large enough to receive the mortar, the gunner, and the assistant gunner. It is small enough at ground level to afford protection against airplane machine-gun fire, and the burst of air-bombs and artillery shells. At the same time, it should allow room for the manipulation of the mortar and provide space for some ammunition. Additional ammunition is placed in nearby shelters. The front edge is sloped so as not to interfere with the sighting of the mortar nor with the trajectory of the shell.

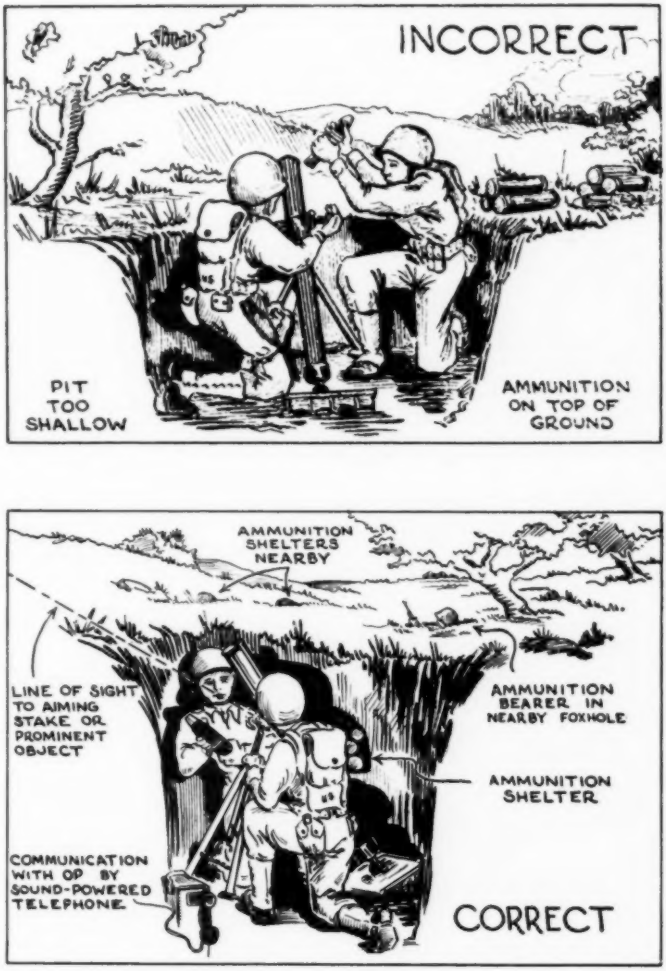

INCORRECT
PIT TOO SHALLOW
AMMUNITION ON TOP OF GROUND
AMMUNITION SHELTERS NEARBY
LINE OF SIGHT TO AIMING STAKE OR PROMINENT OBJECT
AMMUNITION BEARER IN NEARBY FOXHOLE
AMMUNITION SHELTER
COMMUNICATION WITH OP BY SOUND-POWERED TELEPHONE
CORRECT

FIGURE 81.

(5) *37-mm antitank gun*—(a) One type of emplacement can be prepared in a comparatively short time and provides good cover for personnel from flat-trajectory fire. It permits easy removal of the gun from the emplacement. Since most of the gun is above the level of the ground, its concealment is difficult.

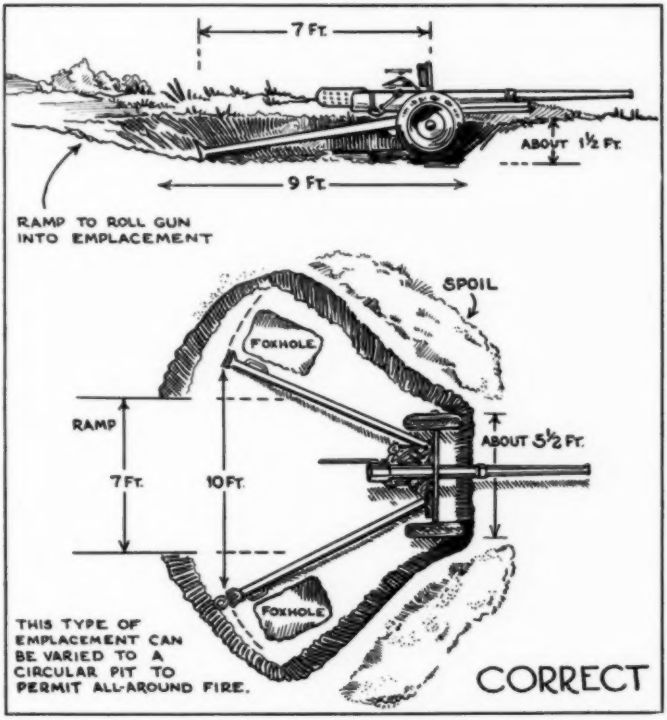

7 Ft.
ABOUT 1½ Ft.
9 Ft.
RAMP TO ROLL GUN INTO EMPLACEMENT
SPOIL
FOXHOLE
RAMP
7 Ft.
10 Ft.
ABOUT 5½ Ft.
FOXHOLE
THIS TYPE OF EMPLACEMENT CAN BE VARIED TO A CIRCULAR PIT TO PERMIT ALL-AROUND FIRE.
CORRECT

FIGURE 82.

(b) Another type of emplacement is suitable for use in stabilized or semi-stabilized warfare, and it lends itself to use in level country where little or no defilade is available. It provides complete cover from flat-trajectory fire for both gun and crew before the gun is put into action. The gun may be readily put into action from a partly defiladed position by pulling it slightly to the rear and digging in the trail. It is easy to conceal from ground or air observation. All members of the crew should dig individual foxholes nearby.

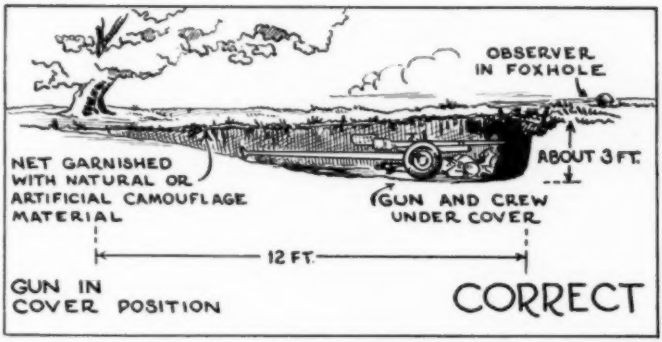


FIGURE 83.

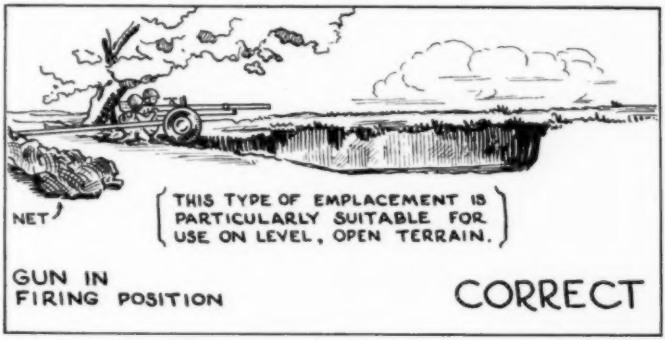


FIGURE 84.

2. *PRINCIPLES OF CONCEALMENT AND COVER.* —Troops should make maximum use of natural and artificial concealment. Natural concealment and cover should be supplemented by camouflage. Since photographs frequently disclose things not visible to an observer's unaided eye, commanders should prevent the making of trails, tracks, or other telltale marks in the vicinity of any work. Concealment measures should be instituted before the enemy has an opportunity to observe and register upon a position. In general, the camouflage of a position is useless if work already begun has been exposed to observation by the enemy.

a. When digging in, save the sod and use it to camouflage the spoil placed around the shelter. Measures taken for concealment aim to defeat both visual reconnaissance and air photographs. Protective measures taken to defeat the camera will ordinarily deceive the eyes of the air observer. Spoil resulting from the digging of foxholes or emplacements should be piled all around the shelter. This affords additional protection against flat-trajectory fire and reduces the chances of being silhouetted.

b. In the organization of a position, protection is sought by digging in, and by dispersion. Foxholes should be at least five yards apart. This will minimize the casualties resulting from one shell burst.

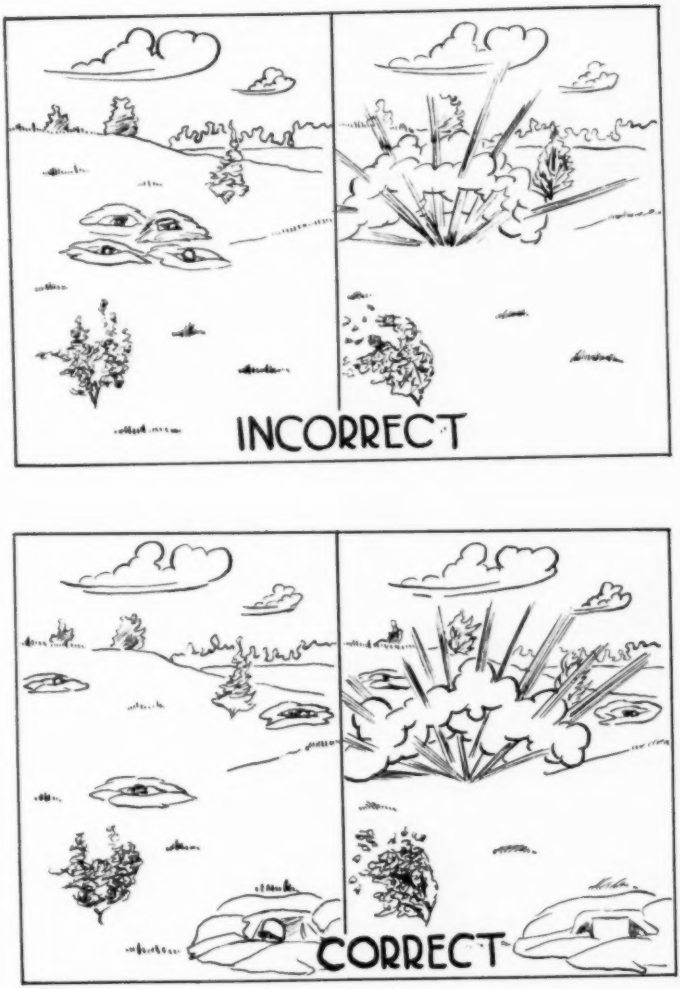
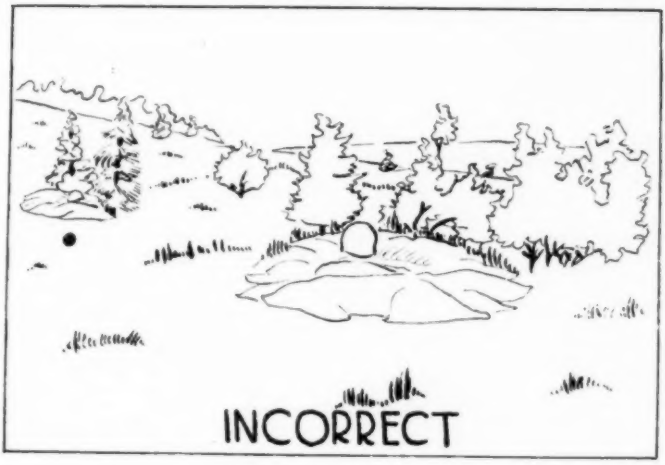


FIGURE 85.

c. Camouflage must be all-inclusive. Partial camouflage is ineffective. After completion, foxholes should be inspected from every angle of approach.



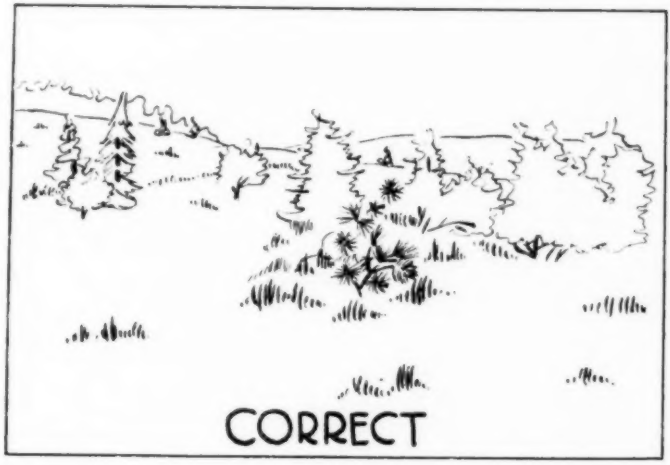


FIGURE 86.

d. When it is possible to do so without hindrance to field of fire, locate shelters where they are concealed by hedgerows or small bushes.

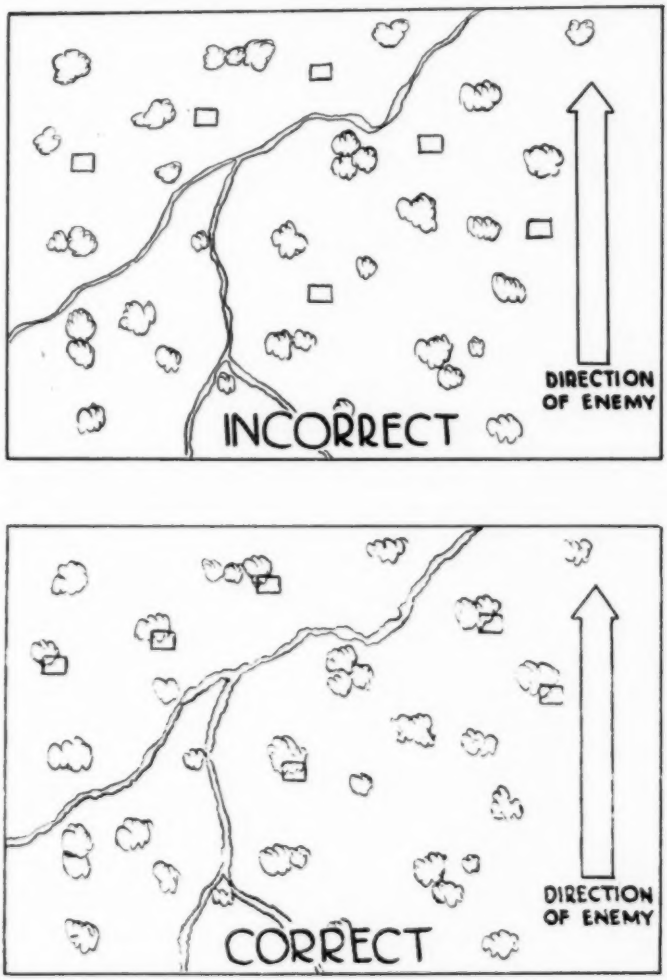


FIGURE 87.

e. Avoid movement across the defense area in the open. Employ covered and concealed routes in moving between installations of the battle position.

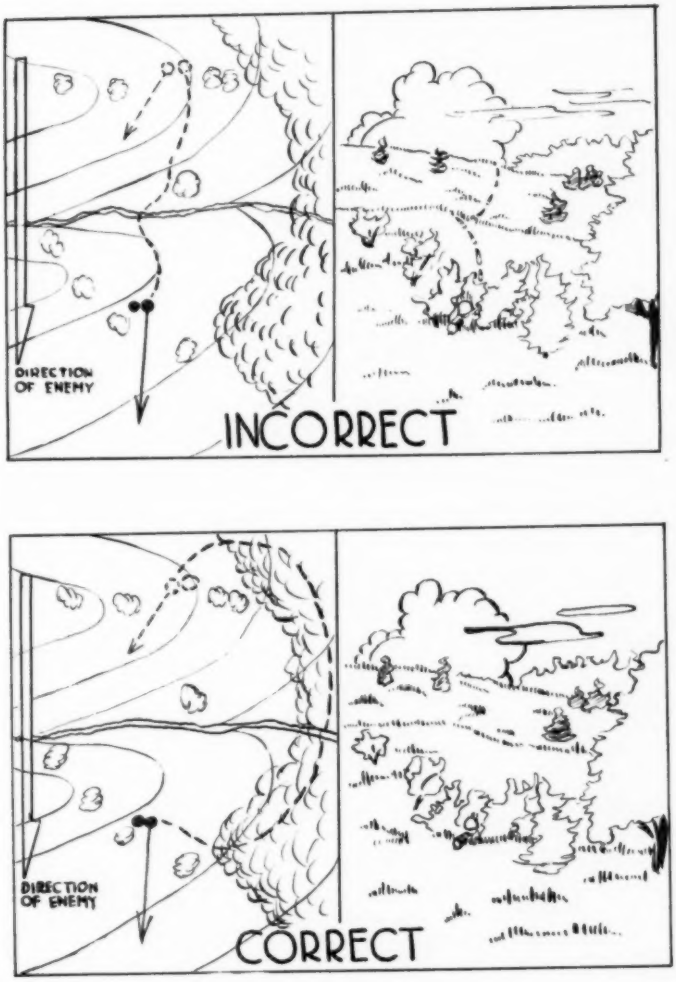
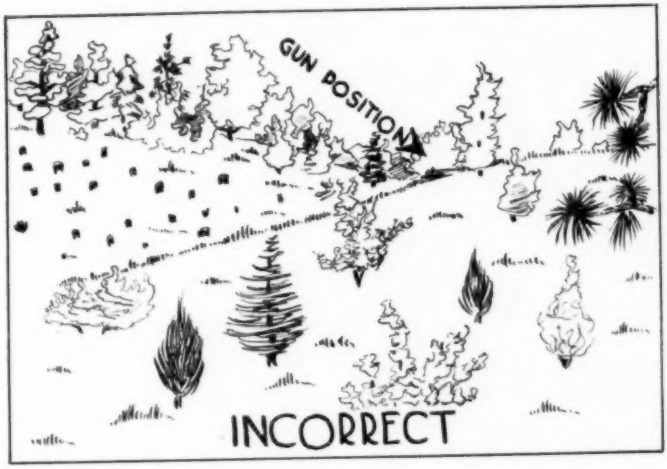


FIGURE 88.

f. Clearing of fields of fire through brush or patches of woods is held to the minimum for effective fires since more complete clearing may indicate firing positions and prepared fires to ground and air observers, or be discernible on air photographs. Straight lines marking the limits of the clearing should be avoided.



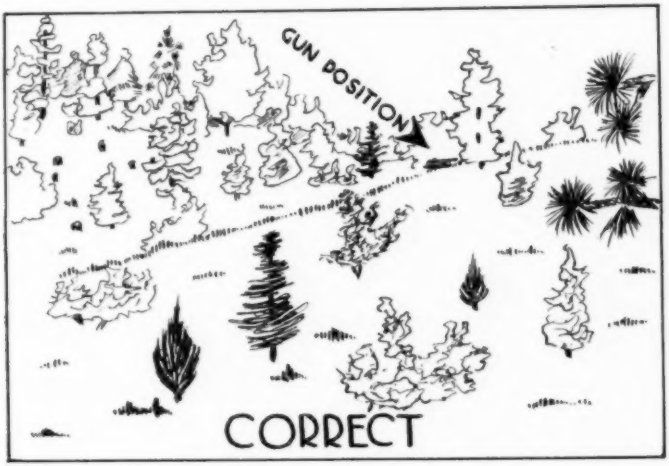


FIGURE 89.

3. *PRINCIPLES OF CONSTRUCTION AND LOCATION OF OBSTACLES.*—Protective obstacles must be near enough for adequate surveillance by day or night, and far enough away to prevent the enemy from bombing the position with hand grenades. Obstacles must be covered by the small-arms fire of the defender to prevent removal by the enemy; they should be concealed by taking advantage of natural irregularities of ground and natural growth.

a. Barbed wire entanglements should be placed at a minimum of 30 yards from the forward defense area, and a maximum of 100 yards.

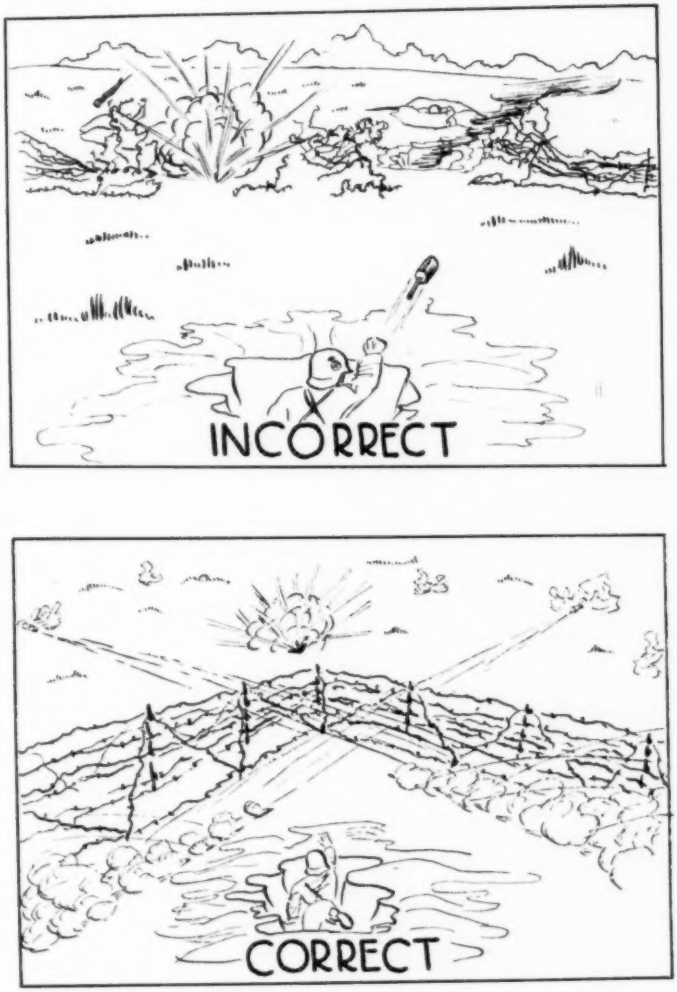


FIGURE 90.

b. In locating protective wire entanglements, every advantage of the terrain must be taken. Wire should be placed along stream courses or through natural vegetation. Where natural means of concealment are not available, the wire must be camouflaged.

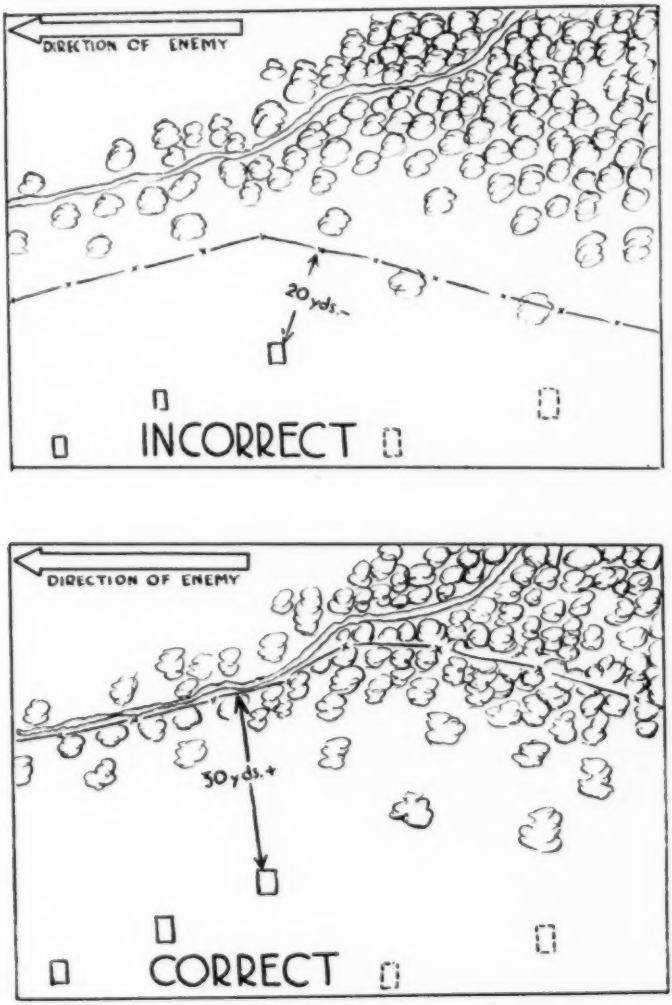

DIRECTION OF ENEMY
20 yds.-
INCORRECT
DIRECTION OF ENEMY
30 yds.+
CORRECT

FIGURE 91.

c. In constructing protective wire entanglements, men should be spaced at intervals so that there will be no bunching nor interference with each other in performance of tasks.

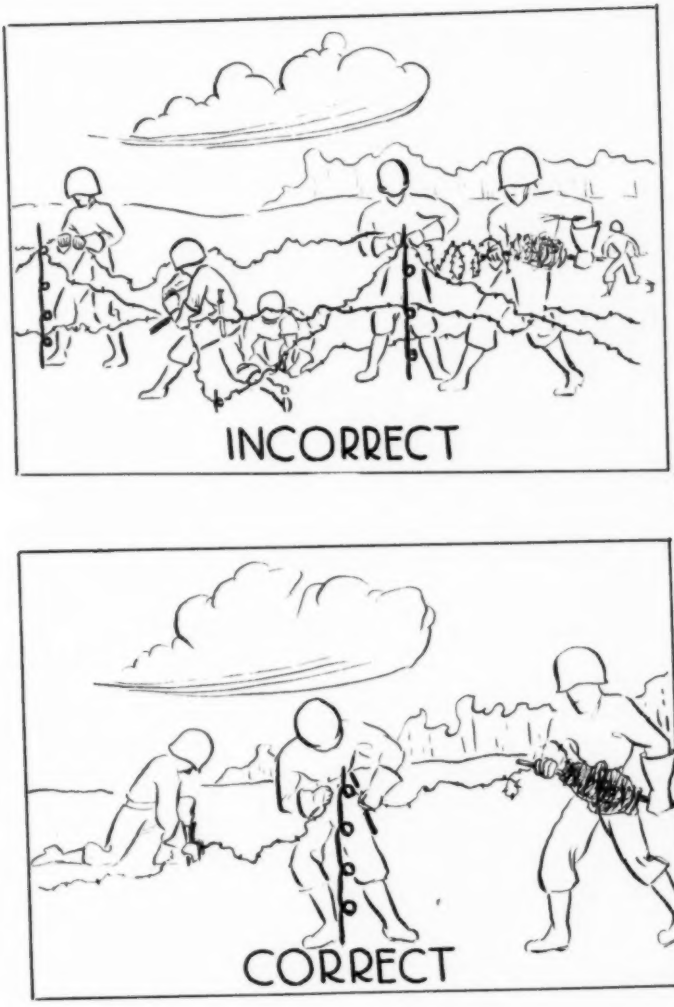


FIGURE 92.

d. The elements of the obstacle nearest the enemy should be placed first, and the work continued toward the rear.

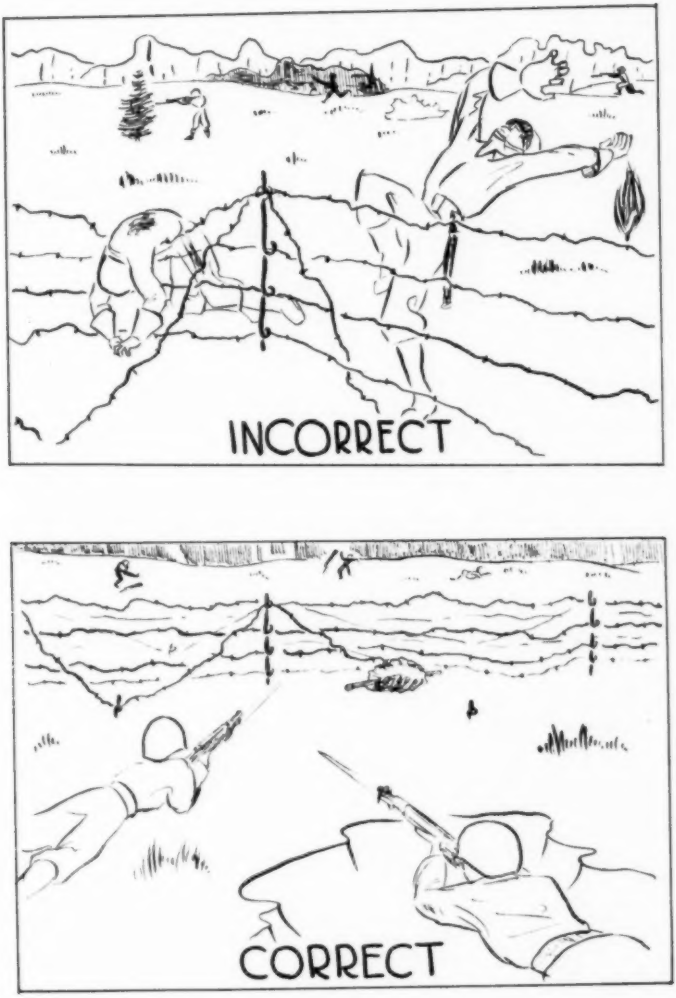


FIGURE 93.

e. Antitank mine fields must be laid within small-arms range and within sight of forward defense areas. When mine fields are laid, immediate reports of their location must be made to higher authority. Accurate sketches showing exact locations of the mine field, fixed by measured distances along compass courses tied into terrain features not likely to be obliterated by battlefield violence, must accompany such reports.

It is necessary that all friendly troops which may be affected thereby be notified, and that the unit establishing antitank mines be responsible, whenever practicable, for removal when the need for the mines has ceased.

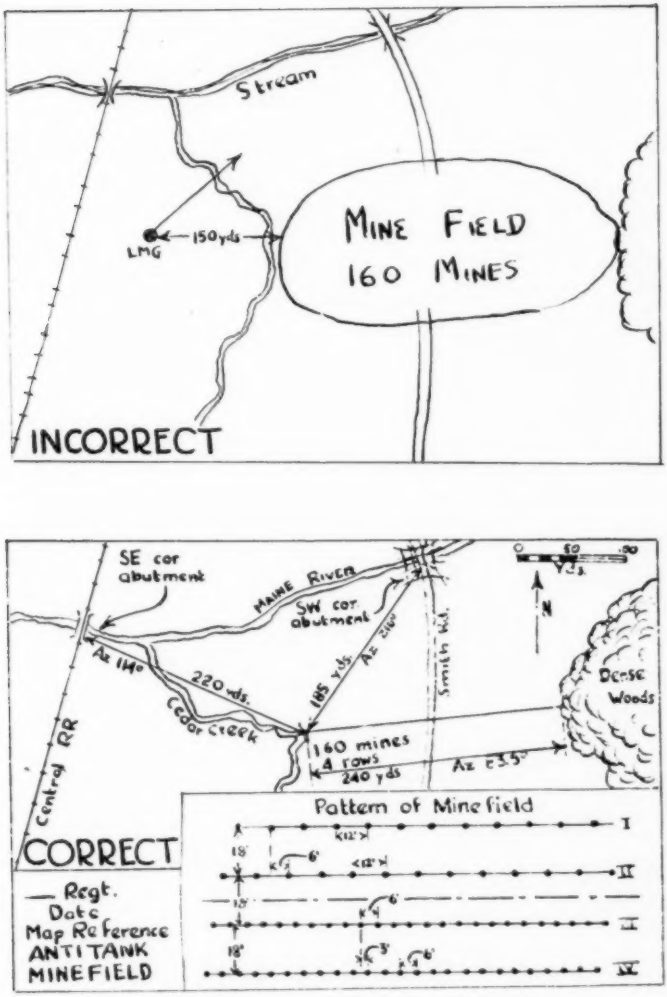

Stream
LMG
150 yds
MINE FIELD
160 MINES
INCORRECT
SE cor abutment
MAINE RIVER
SW cor abutment
Az 140°
220 yds.
185 yds.
Az 240°
Smith Rd.
Cedar Creek
Central RR
160 mines
4 rows
240 yds
Az 355°
Dense Woods
N
CORRECT
Pattern of Mine field
Regt.
Date
Map Reference
ANTI TANK
MINE FIELD

FIGURE 94.

4. *PRINCIPLES OF POSITIONS OF SUPPORTING WEAPONS.*—In addition to the measures taken for the intrenching and camouflaging of the actual positions of supporting weapons, the selection of the location of such positions has an important part in providing the maximum protection possible. In conjunction with the consideration given to the tactical mission, every advantage is taken of terrain features to secure concealment of the primary, alternate, and supplementary positions. Favorable routes of approach to positions and for displacement therefrom,avoidance of unnecessary movements, and the occupation of foxholes by personnel when not required at firing position are all factors contributing toward protection. Others are:

a. Supplementary positions for machine guns from which long-range fire missions are to be fired must be located at least 200 yards in front, or in rear, of platoon defense areas, otherwise their fire will disclose the location of other units of the area. Covered routes to primary positions should be available.

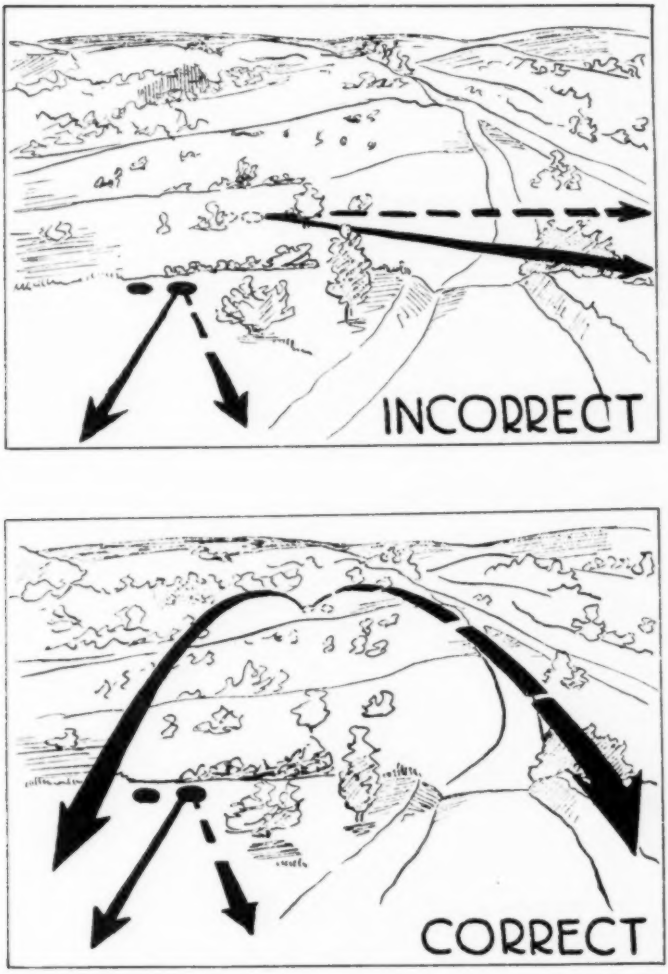


FIGURE 95.

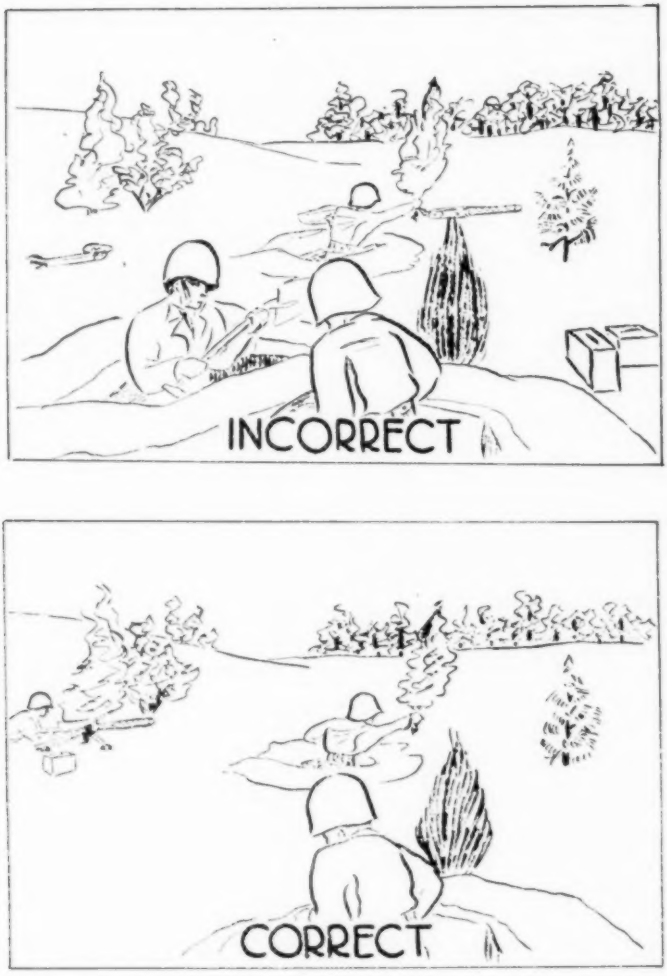


FIGURE 96.

b. During the organization of the position, machine guns must be set up in emergency firing positions in order to be able to render prompt support to the organization of the ground.